MEETING AGENDA

TUALATIN PLANNING COMMISSION

September 15, 2016; 6:30 p.m.
JUANITA POHL CENTER
8513 SW TUALATIN RD
TUALATIN, OR 97062

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1. **CALL TO ORDER & ROLL CALL**
   Members: Alan Aplin (Chair), Bill Beers, Kenneth Ball, Angela Demeo, Travis Stout, Mona St. Clair, and Janelle Thompson.
   Staff: Aquilla Hurd-Ravich, Planning Manager; Charles Benson, Associate Planner; Tony Doran, Engineering Associate.

2. **APPROVAL OF MINUTES**

3. **COMMUNICATION FROM THE PUBLIC (NOT ON THE AGENDA)**
   Limited to 3 minutes

4. **ACTION ITEMS**

   A. Consideration to Amend the Tualatin Development Code Chapter 70: Flood Plain District to meet minimum National Flood Insurance Program requirements. Plan Text Amendment 16-01 is a legislative matter.

5. **COMMUNICATION FROM CITY STAFF**

   A. Mobile Food Units (Food Carts): Research Results and Regional Examples

6. **FUTURE ACTION ITEMS**

7. **ANNOUNCEMENTS/PLANNING COMMISSION COMMUNICATION**

8. **ADJOURNMENT**

STAFF REPORT
CITY OF TUALATIN

TO: Tualatin Planning Commissioners

FROM: Lynette Sanford, Office Coordinator

DATE: 09/15/2016

SUBJECT: **APPROVAL OF MINUTES**

ISSUE BEFORE TPC:

Attachments: TPC Minutes May 19, 2016

City of Tualatin

www.tualatinoregon.gov

UNOFFICIAL

TUALATIN PLANNING COMMISSION - MINUTES OF May 19, 2016

TPC MEMBERS PRESENT:
Alan Aplin
Jeff DeHaan
Angela Demeo
Cameron Grile
Mona St. Claire
Janelle Thompson

STAFF PRESENT
Aquilla Hurd-Ravich
Zoe Monahan
Alice Cannon
Karen Perl Fox
Charles Benson III
Erin Engman
Lynette Sanford

TPC MEMBER ABSENT: Bill Beers

GUESTS: Sara Singer, Joe Lipscomb, Sherman Leitjeb, Grace Lucini

1. CALL TO ORDER AND ROLL CALL:

Alan Aplin, Chair, called the meeting to order at 6:32 pm and reviewed the agenda. Roll call was taken.

2. APPROVAL OF MINUTES:

Mr. Aplin asked for review and approval of the March 17, 2016 TPC minutes. MOTION by St. Clair SECONDED by Thompson to approve the minutes as written. MOTION PASSED 6-0.

3. COMMUNICATION FROM THE PUBLIC (NOT ON THE AGENDA):

Joe Lipscomb, a member of the Tualatin Area Aging Task Force, gave an update on the group and expressed concerns of the members. Mr. Lipscomb stated that the Aging Task Force has become involved with transportation mobility, the SW Corridor Plan, and accessibility to transit centers. Mr. Lipscomb noted that they are interested in safe sidewalks and pedestrian paths, which currently do not meet the needs of the aging population. The group is also looking at housing issues and is working with AARP. Mr. Lipscomb acknowledged that adding light rail will not help the aging population and other issues of concern are sidewalk width, crosswalk location, and traffic signal timing.

Mr. Aplin stated that he received a Service Enhancement Plan update from TriMet that addresses some of these issues.

Alice Cannon, Assistant City Manager, stated that TriMet adopted a Service

Enhancement Plan that maps out the investments for the next 20 years. She added that Tualatin will open a new transit line between Sherwood and Tualatin on May 31, which will run during the commuting hours.

4. ACTION ITEMS:

None.

5. COMMUNICATION FROM CITY STAFF:

Ms. Cannon announced that the Planning Division has new staff members. Erin Engman is the new Assistant Planner who most recently worked for HDR Consulting. She has 5-8 years of experience in planning, and is also a talented graphic designer. Charles Benson is the new Associate Planner. He has experience in the private and public sector and has worked in Massachusetts and New York. Karen Fox is our new Senior Planner. She has an extensive background and will be working on long-range projects including Basalt Creek and updating the Development Code.

Ms. Cannon also announced that Melinda Anderson is the new Economic Development Manager and Chris Ragland is the new Building Official.

A. Civic Center Outreach.

Sara Singer, a former employee of the City Manager's office, is a consultant for the Civic Center Outreach project. Ms. Singer noted that she has been working on this project since 2013 and is here this evening to present an update.

Ms. Singer stated that during the months of May and June, she is working with the City to gauge public support for a new City Hall and expanded library. The City of Tualatin has never had a City Hall or "Civic Center" and the staff members are currently working out of seven different buildings around town. In 2014 the Council Building was torn down to make way for the Nyberg street expansion. This displaced some City staff members along with the Municipal Court and Council Chambers. Following that, the City conducted a long range facilities study and collected hundreds of ideas from the community on locations for a future Civic Center. Nine different sites were studied, which was narrowed down to two feasible options: the site next to the Tualatin Police Department and a site on the Tualatin Commons.

Ms. Singer explained that the site on the Tualatin Commons would house a three-story structure with 30,450 square feet of office space. 13,220 square feet could be leased, which would generate revenue for the City and create opportunity for expansion. By adding a new building here, it could revitalize the commons with the retail space and civic presence. The traffic study for this location was favorable over the Police site.

Ms. Singer stated that the Police Department site would be a two-story building with

30,290 square feet of office space, but no leasable space. Ms. Singer explained that by consolidating services in either of these locations, the City would create additional space for the Library to expand at its current location.

Ms. Singer noted that the cost of the Tualatin Commons site is $32.1 million which would include the cost of purchasing the site. The cost of the Police site is $24 million. Both of these options include the Library expansion. Outreach for these options has included an on-line survey and the Bridgeport Farmers Market. Council is seeking input as they consider adding this to the November 2016 ballot for the voters to decide.

Ms. St. Clair inquired about parking at the Commons site. Ms. Singer replied that there would be underground parking that would need to be raised above the flood plain and there will be surface parking at the back of the building. Ms. Demeo asked about the impact of displacing the businesses in the strip mall at the Commons site. Ms. Singer replied that conversations have been made with the property owner and the leases would need to be negotiated. Mr. Aplin asked if the Commons cost included the tenant space revenue. Ms. Singer replied that it does not. Ms. Thompson asked why the Commons site is higher in price. Ms. Singer replied that the City will have to purchase the space and the construction will take longer. Ms. Demeo asked how long construction will take. Ms. Singer replied it would be roughly 18 months for the Police Site and the Commons site would take approximately 21 months. Mr. Aplin asked when a decision will be made to put this on the ballot. Ms. Singer replied that Council will make a decision on July 11.

Mr. DeHaan acknowledged that he liked the options and supports putting them on the ballot, but was disappointed that the Council Chambers had to be demolished. He added that he believes the Commons needs revitalization, but traffic is an issue.

Mr. Aplin inquired about encroaching on the water with landscaping. Ms. Singer replied that it would have a plaza along the water with the retail space. Ms. St. Clair asked if having City employees in that location will make it more likely for a retail tenant to survive. Ms. Singer replied that the belief is that the City offices would create an anchor for the space and also increase activity by the lake.

Ms. Hurd-Ravich asked about other jurisdictions using the rental space. Ms. Singer replied that Washington County is currently looking for additional office space and depending on the timing; this could be a great opportunity for County services in the City.

Mr. Grile asked if there are other examples of City offices with ground floor retail space. Ms. Singer replied that Hillsboro and Beaverton have similar situations and that the Beaverton office generates a million dollars of revenue income per year. Mr. Grile asked if their offices are approximately the same size as to what we're proposing. Ms. Singer replied that both of their buildings are larger.

B. Southwest Corridor – Shared Investment Strategy

Zoe Monahan, Management Analyst, gave an update on the SW Corridor. Ms. Monahan stated that the project is moving forward. The Steering Committee recently selected light rail as the mode and decided not to continue to study a direct tunnel to PCC. The project team is getting ready for a Draft Environmental Impact Study (DEIS) process to study the proposed alignment which will likely extend from Portland to Tigard and terminating at Bridgeport Village.

Ms. Monahan stated that this is a multi-modal project for bicycle, pedestrian, and roadway projects along with the transit line. In 2013 the Steering Committee accepted a large list of projects that go along the alignment. Ms. Monahan presented a diagram that showed the links and stated there will be a public involvement process that will begin in August and September. Ms. Monahan added that there is still time for input from the Commission members.

Ms. Cannon added that one idea was to extend the Tualatin River Greenway Trail north along the freeway and ending at a park and ride near the new station. Ms. Cannon stated that this could cost as much as 25 million and asked if it was worth addressing. She added that we cannot fund locally and may need transit funds.

Mr. Aplin asked if the light rail was the most expensive option. Ms. Monahan replied that is it more expensive initially, but it allows additional capacity in the long term over rapid bus transit.

Mr. DeHaan asked if they have a name for the new light rail line and he proposed the purple line. He also mentioned that he was disappointed that the Tualatin option was dropped from the potential routing and asked if it was dropped due to expense or public comment. Ms. Monahan said there are constraints in the landscape and it would have been expensive. She added that serving downtown Tualatin is important and the new 97 bus line is a way to provide service. This will eventually link to the new light rail in Bridgeport.

Ms. Demeo expressed concern about the extra traffic at Bridgeport Village and noted that it's already extremely busy beginning at 3 pm. She wondered if a traffic study has been conducted. Ms. Monahan replied that in the impact study, a traffic analysis will be added. Ms. Cannon added that traffic usually improves with light rail.

Ms. Thompson stated that linking our existing pathways is a good idea because one constraint we have is crossing the river and easier access across the river would be beneficial.

Mr. Aplin inquired about the cost. Ms. Monahan replied that the estimate is around 2.4 billion and the estimate for reaching the downtown area was 3 billion. Mr. Grile asked if there was discussion about how much federal funding would be involved.

Ms. Monahan replied that hopefully half of it would be funded by federal funds. Ms. Cannon added that the main reason Tualatin was dropped was due to funding and the expense involved. Mr. DeHaan reiterated that it could have really impacted Tualatin in a good way.

C. Basalt Creek Open House Update

Karen Perl Fox, Senior Planner, gave an update on Basalt Creek which included a Power Point presentation. Ms. Perl Fox stated that we are in the early stages of the Basalt Creek plan. On April 28, 2016 an Open House was held which included conceptual land uses, infrastructure design and other elements to engage and inform citizens about the project.

Ms. Perl Fox noted that this engagement event included an informative presentation by Consultant John Fregonese. The presentation included an overview of the concept planning progress to date and the timeline going forward to complete it. There was also an interactive polling event, an open question and answer session and small group discussions with staff from Tualatin and Wilsonville organized around a series of topics presented on large posters.

Ms. Hurd-Ravich stated that in January the two Councils decided on a preferred boundary which will follow the Basalt Creek Parkway. Also identified were ten considerations for success which included items such as sewer, storm, and water. Following that meeting, an Agency Review Team meeting was held which included interested agencies such as Metro, Washington County, Clean Water Services, TriMet, Smart, and the Tigard-Tualatin School District. The information gathered at this meeting will be combined with the open house information.

Ms. Perl Fox stated that the themes from the Joint Council session included capitalizing on the area's assets, protect existing neighborhoods, integration of employment and housing, and high quality design and amenities for employment.

Ms. Perl Fox went through the slides which detailed maps of the road network concept, land use concept, bikes, trails and pedestrian network, transit network, and the parks and natural areas. She also presented the results from the interactive polling that was conducted.

The next steps in this process are working on the Draft Concept Plan, presenting the draft for Council feedback, and then finalizing the plan. This Concept Plan will include:

- The planning process
- Considerations for success
- Land use plan
- Service plan for water, stormwater and sewer
- Transportation plan

- Implementation strategies

The additional documents that will be developed are:

- Metro Regional Framework Plan Memo
- Draft Comprehensive Plan Amendment for Wilsonville
- Draft Comprehensive Plan Amendment for Tualatin
- Intergovernmental Agreements for a variety of topics

Ms. Perl Fox noted stated that the tentative review process will be presented at the Wilsonville City Council meeting on June 6 and a Tualatin City Council meeting on June 13.

Mr. Aplin inquired about the intergovernmental agreement and if we will serve our own jurisdiction or share. Ms. Hurd-Ravich replied that each City will serve its own jurisdiction. There are some areas in Basalt Creek that may be more efficiently served by one jurisdiction over the other.

Mr. DeHaan asked if Planning Commission will have an action item regarding the Basalt Creek Plan. Ms. Hurd-Ravich replied that they will be making a recommendation that will go to Council and when it comes time to implement the comprehensive plan amendments, the Planning Commission will be involved in making recommendations on legislative items.

Mr. Aplin asked about how the SW Concept Plan will affect the Basalt Creek area. Ms. Hurd-Ravich replied that they looked at the SW Concept Plan and will determine what type of land use would be assigned there. They have looked at efficiencies by combining these two planning areas.

Mr. DeHaan inquired how this would be funded. Ms. Hurd-Ravich noted that this will be paid for with development fees, but there will have to be some investment by developers to capture that funding. The other piece is to put these improvements into the Capital Improvement Plan. A market analysis was conducted and there is a high demand for residential.

Ms. Demeo asked about the reasoning for the crossover to I-5 and Day Rd. Ms. Hurd-Ravich responded that the crossover came from the Transportation Refinement Plan and the counties are responsible for the funding.

Grace Lucini, 23677 SW Boones Ferry Rd, Tualatin, OR

Ms. Lucini is a resident of the unincorporated area of Washington County within the Basalt Creek Concept Planning Area. She had questions and concerns that she brought to the Planning Commission, which have been added to the minutes as an attachment.

Sherman Leitjeb, 23200 SW Grahams Ferry Rd, Tualatin, OR

Mr. Leitjeb has lived in the Basalt Creek Planning Area for approximately 26 years and is in the real estate business. He had a few concerns to bring to the Commission. The first concern he noted was that the area in the canyon is being described as a creek, but in reality has very little water and is a breeding ground for mosquitoes.

Mr. Leitjeb expressed apprehension regarding the Kinsman Rd extension. He believes a large road is undesirable in the canyon and is financially irresponsible. He does support the Boones Ferry Rd and Grahams Ferry Rd expansion.

Mr. Leitjeb also noted that he did not appreciate how the questions were being phrased to the public. For example, the public is in support of parks but he feels the parks will not be utilized because the residents are being forced out. The residents in that area bought their homes hoping for future residential, not industrial or multi-family. He requested a buffer area for the existing homeowners as a transition.

6. FUTURE ACTION ITEMS

Ms. Hurd-Ravich stated that we will bring back the discussion on food carts later in the summer. There will also be additional discussion on the draft of the Basalt Creek Concept Plan.

7. ANNOUNCEMENTS/PLANNING COMMISSION COMMUNICATION

Ms. Demeo inquired about openings on the Planning Commission. Ms. Hurd-Ravich responded that when a three year term is up, the members have to reapply. Mr. Grile stated that he will not be reapplying due to family commitments.

8. ADJOURNMENT

MOTION by Aplin to adjourn the meeting at 8:20 pm.

_____ Lynette Sanford, Office Coordinator

PUBLIC COMMENTS –

Hard Copy sent to City of Tualatin 5-20-16

5-19-16 TUALATIN PLANNING COMISSION MEETING

Grace Lucini

23677 SW Boones Ferry Road, Tualatin OR 97062

I am a resident of unincorporated Washington County within the Basalt Creek Concept Planning Area.

My neighbors and I have no elected representation within the concept planning process- no one to advocate for our homes and property rights.

Since 2011, I have attended or viewed almost all of the public meetings held on the Basalt Creek Transportation Refinement Planning by Washington County, the City of Wilsonville, and the City of Tualatin. I have done the same for the Basalt Creek Concept Planning meetings by the City of Wilsonville and the City of Tualatin.

COMMENTS

I appreciate the current efforts to keep the public and interested persons notified as to public meetings on Concept planning. It took a lot of time to constantly have to monitor websites to learn about these public meetings for all three governmental agencies. I request the Notices of Public meetings on this subject continue as the staff prepares to present their final Concept Plan later this year.

In the Future -I request …

1. When the Basalt Creek area is described in the media and in meetings- it is usually referred to as 800+ acers of undeveloped land.
2. There are many people who have long standing existing homes within the area. In fact, one development with very nice homes – homes which would make any city proud- was built before many of the neighborhoods in the City of Tualatin.
    a. We bought homes built in this area which were appropriately zoned for our homes at the time.
    b. Many of us have lived in these homes for 10 or 20+ years.
    c. I take a very high interest in my home and the property it sits on. I am working to restore the wetlands on my property.
    d. We have the attributes of a neighborhood, but have not been given the same consideration or protections from negative impacts or requirements for “buffering” from the Basalt Creek Transportation plans or Concept Planning ---as have the residents currently within the city limits of Tualatin.

e. To continually have project staff refer to my home and those of my neighbors as “undeveloped land” paints an inaccurate picture of the area being planned. It is somewhat disrespectful as well as inaccurate in implying that all 800+ acers are an empty canvas needing to be planned for development.

f. Ironically, some of us will eventually become citizens of Tualatin.

g. Yet- with the construction of the Grahams Ferry Road Boones Ferry Connector- a majority of this neighborhood I mentioned -will be demolished or significantly and negatively impacted with the building of the connector bridge. This neighborhood was not given the same considerations as neighborhoods in Tualatin.

NATURAL AREAS-PARKS

The Planning Commission is being asked about planning for Natural Areas within the Basalt Creek Area.

1. As the Planning Commission considers this request- please keep in mind- the wetlands between Grahams Ferry Road and Boones Ferry Road are privately owned. The wetlands are in the middle of my property- with useable property on the east and west sides of the wetlands.

    a. To envision a walking trail along the wetlands will require the public acquisition of privately owned land from many different property owners.

    b. If the trails are planned along the wetlands, the trail would cut my property in half and reduce my use and enjoyment of my property.

2. The current map presented at the Open House indicates a public trail along the western edge of my property. In light of the recent news articles regarding the Spring Water Trail, I am not overly interested in creating a similar situation on or along my property.

QUESTIONS WITHIN SCOPE OF PLANNING COMMISSION:

I am requesting these questions be included within the minutes of this Planning Commission Meeting.

Many of these questions should not be a surprise to the project staff, as they have been previously presented in writing or previously asked in person- and yet do not appear to be addressed in the subsequent reiterations of the proposed maps.

TRANSPORTATION

1. Grahams Ferry Boones Ferry Connector

    a. *A major premise of the Basalt Creek Concept Planning*-- including changes in jurisdiction as well as changes framework for the transportation system ----<u>is based upon the location of the future connector between Grahams Ferry Road and Boones Ferry Road</u>

b. At what point in time will geo technical testing be done on the basalt 100' island in the middle of the wetland which is the planned footing for the connector bridge? This island the primary basis upon which WA County determined the location of the future bridge.

c. It is my understanding that basalt rock and basalt rock formations have varying degrees of density and strength- and not all basalt rock used from nearby quarries can be used in road construction.

d. What happens should the testing of the basalt island prove not to be desirable with regard to transportation plans- zoning etc.

2. Kinsman Road Extension

a. At the last Basalt Creek Joint Cities Meeting of both Tualatin and Wilsonville City Councils Meeting- it was discussed and agreed upon that the Kinsman extension north of Day Road would be tabled.

b. Why is the extension still on the current maps?

c. If there are still plans for the extension- how will the extension cross the Grahams Ferry -Boones Ferry Connector- since the connector will require a significant V cut into the ridge running north to south. Is it anticipated Kinsman extension will be a fly over or be dug under the 5-6 lane expressway?

d. To facilitate better understanding of the impact of proposed roads and the ability to actually implement- I have previously requested the staff provide a topographical overlay in their presentations. I again request this additional information be provided to those who may not be aware of the mountain ridges and a significantly deep ravine which exists within the area- through which roads have been planned.

3. Access to I-5 at Exit 286- Day Road & Boones Ferry Road Intersection

a. The intersection and interchange is already congested at peak hours.

b. During a WA County presentation to the Tualatin City Council on their recommended location for the Grahams Ferry Road/ Boones Ferry Rd Connector-the project engineer acknowledged the anticipated volume of traffic at the Day Road Boones Ferry intersection will be 2 ½ times the volume on the Tualatin Sherwood Highway.

i. When asked about the existing and anticipated congestion- the comment that ***we have to get use to waiting for more than one signal change*** does not seem to understand the importance of local knowledge and the magnitude of the current problem

ii. Waiting more than one signal rotation is not a generally accepted standard by most mulicipalities

iii. And not an appropriate response by a facilitator/planner of a multi-governmental group whose goal is to address future transportation needs in planning future growth and development.

ZONING

1. Requesting clarification of the level of importance being given to what is being designated as Natural Area west of Boones Ferry Road

    a. During the discussions between WA County, Wilsonville and Tualatin- it was decided a 5-6 lane bridge (with additional bike and pedestrian lanes) would be built which will bisect this natural area

        i. Design plans for the bridge and expressway show significant cut and fill into the wetlands and through Class 1 Riparian areas and also Class A Upland areas

        ii. Construction of the bridge will greatly impact the natural area; wetlands and surrounding habitat and wildlife

        iii. Upon completion there will be negative influences by

            1. Night time light pollution

            2. 24 hour a day ----noise; air pollution; and wetland environmental pollution from freight trucks and other vehicles attempting ascent or decent down a 6% grade with signaled intersections at the top and at the bottom of the segment between Grahams Ferry and Boones Ferry

    b. But the proposed zoning for the same area only indicates natural area and no development

    c. Why is there a discrepancy in use of this area? Which pollutes more ----the construction of the bridge and the thousands of trucks and vehicles 24 hours a day using the bridge; or single family homes?

2. Zoning east of SW Boones Ferry Road north of Greenhill Lane

    a. Is it reasonable to plan for neighborhood/commercial development <u>across from existing single family homes</u>?

    b. Current Tualatin residents get significant consideration in the planning process for buffering between existing residences and other zone uses

    c. Should existing residents within the Basalt Creek be given the same considerations for buffering as Tualatin residents receive?

    d. Can the location of the neighborhood-commercial development be relocated from what is already going to be a high volume road- Boones Ferry Road?

    e. If the location of the proposed neighborhood-commercial area cannot be relocated,

        i. can requirements for neighborhood-commercial construction be designated for retail on the ground floor and residential above (to blend into the existing community and the planned community) or some other method which will enhance and blend with the residential neighborhood environment--and

ii. can architectural considerations be applied as to the view from SW Boones Ferry Road- as this will be the entrance to Tualatin and well as the view from the local residents who already live in the area.

STORM WATER DRAINAGE

1. The area within the natural area west of Boones Ferry Road is within the Willamette Watershed.
    i. Maps presented at the Open House indicate water runoff from east of Boones Ferry Road will be diverted to drain west.
    ii. How will contaminated water from streets and sediment which flows into the ravine on the west side of Boones Ferry Road be treated prior to flowing to the Willamette?

I ask that the Planning Commission consider these questions now and in the future as you review the information presented, and ask for further clarification as needed.

After the presentation of my comments, I appreciated the request by Aquilla Hurd-Ravich, Planning Manager for the City of Tualatin for a copy of my comments that my concerns could receive further evaluation and provide response.

Respectfully submitted,

Grace Lucini

STAFF REPORT
CITY OF TUALATIN

TO: Tualatin Planning Commissioners

FROM: Tony Doran, Engineering Associate
Jeff Fuchs, City Engineer

DATE: 09/15/2016

SUBJECT: Consideration to Amend the Tualatin Development Code Chapter 70: Flood Plain District to meet minimum National Flood Insurance Program requirements. Plan Text Amendment 16-01 is a legislative matter.

ISSUE BEFORE TPC:

Planning Commission consideration of a Plan Text Amendment to update Tualatin Development Code Chapter 70: Flood Plain District to meet minimum National Flood Insurance Program requirements. Staff is seeking a recommendation from the Planning Commission to the City Council on the draft code language for the proposed amendment.

RECOMMENDATION:

Staff recommends the Planning Commission consider the staff report, draft language, and analysis and findings and make a recommendation to the City Council.

EXECUTIVE SUMMARY:

A letter dated May 4, 2016 to The Honorable Lou Ogden, Mayor of the City of Tualatin, was sent from Luis Rodriguez, P.E. Chief, Engineering Management Branch, Federal Insurance and Mitigation Administration. Additionally, a letter and adoption booklet dated July 22, 2016 The Honorable Lou Ogden, Mayor of the City of Tualatin, was sent from Rachel Sears, Director of the Floodplain Management Division, Mitigation Directorate, Federal Emergency Management Agency.

These letters identified November 4, 2016 as the effective date for the new Flood Insurance Study and Flood Insurance Rate Map that has been completed for Tualatin. By this date the Department of Homeland Security's Federal Emergency Management Agency Regional Office is required to approve the legally enforceable floodplain management measures Tualatin adopts in accordance with Title 44 Code of Federal Regulations Section 60.3(d).

These letters are Federal Emergency Management Agency's official notification that Tualatin has until November 4, 2016 to adopt and/or submit a floodplain management ordinance that meets or exceeds the minimum National Flood Insurance Program requirements and request approval from the Federal Emergency Management Agency Regional Office by the effective

date. Approval by the Federal Emergency Management Agency Regional Office by November 4, 2016 will enable Tualatin to avoid suspension from the National Flood Insurance Program.

Tualatin's City Attorney has evaluated Federal Emergency Management Agency's model ordinance with the current Tualatin Development Code Chapter 70: Flood Plain District text and proposed code language to update our code to meet the minimum National Flood Insurance Program requirements.

PREVIOUS STEPS
August 31st - Draft ordinance and analysis emailed to Department of Land Conservation and Development
September 9th - Public Notice Letter mailed to all properties located within floodplain
September 9th - Public Notice requested to be published in Oregonian newspaper (between 20 and 40 days prior to 1st City Council meeting, which is the Public Hearing

NEXT STEPS
October 10th - 1st City Council meeting, which is the Public Hearing
October 24th - 2nd City Council meeting, which is to adopt the Ordinance
November 4th - Federal Emergency Management Agency's deadline

OUTCOMES OF DECISION:
A recommendation to approve the Plan Text Amendment would result in the following changes to Tualatin Development Code Chapter 70: Flood Plain District:

- Section 70.050 will be amended to adopt Flood Insurance Rate Map, Washington County, Oregon and Incorporated Areas," effective date November 4, 2016.
- Section 70.135 Provide Base Flood Elevation and Freeboard to Building Official will be added.
- Section 70.180 Specific Standards will be amended to provide specifics as to how residential construction with fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters.
- Section 70.200 Alterations to Floodplain, Drainage, or Watercourses will be added to provide specifics for Applicants proposing to increase the Base Flood Elevation by more than one foot or alter a watercourse to obtain a Conditional Letter of Map Revision (CLOMR) from FEMA.

A recommendation to deny the Plan Text Amendment would result in the following:

- The Tualatin Development Code will not be updated and Tualatin would be suspended from the National Flood Insurance Program.
- Flood insurance will no longer be available in Tualatin. No resident or business will be able to purchase or renew a flood insurance policy.
- No federal grants or loans for buildings would be made in identified flood hazard areas. Incudes all federal agencies such as HUD, EDA, Small Business Administration, HHS, etc.
- No federal disaster assistance would be provided in the form of loans for repair or reconstruction of buildings in identified flood hazard areas.

- No federal mortgage insurance would be provided in identified flood hazard areas. This includes FHA, VA, Farmers Home, etc.
- No Fannie Mae, Freddie Mac, and GMNA purchase of mortgages in the secondary market would be made if the properties that are the subject of these mortgages are located in Special Flood Hazard Areas of nonparticipating communities.
- Lenders of conventional loans would be required to notify the buyer or lessee that property is in a flood hazard area and would be required to notify the buyer or lessee that property in flood hazard area is not eligible for federal disaster relief in a declared disaster.
- If flooding occurs, it is possible that the local government could be held liable by residents and/or businesses who could not get flood insurance because of the decision not to participate in the National Flood Insurance Program.

ALTERNATIVES TO RECOMMENDATION:

The alternatives to the Planning Commission recommendation are:

1. Approve the proposed Plan Text Amendment with alterations to the draft language.

2. Deny the proposed Plan Text Amendment.

FINANCIAL IMPLICATIONS:

The FY 2016/2017 budget accounts for the costs of City initiated code amendments.

Attachments:

A - Adoption Notice to Mayor May 4th
B - Adoption Notice to Mayor July 22nd
C - Adoption Booklet From Notice to Mayor July 22nd
D - FEMA Model Ordinance
E - Proposed Ordinance
F - Analysis and Findings
G - FIRM Area Comparison 1987 to Current
H - Tax Lots With Floodplain
I - FIS Volume 1
J - FIS Volume 2
K - FIS Volume 3
L - FIRM Index
M - FIRM Panel 539E
N - FIRM Panel 543E
O - FIRM Panel 544E
P - FIRM Panel 563E
Q - FIRM Panel 606E

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
19P

May 4, 2016

The Honorable Lou Ogden
Mayor, City of Tualatin
18880 Southwest Martinazzi Avenue
Tualatin, Oregon 97062

Community: City of Tualatin,
Washington County, Oregon
Community No.: 410277
Map Panels Affected: See FIRM Index

Dear Mayor Ogden:

This is to formally notify you of the final flood elevation determination for the City of Tualatin, Washington County, Oregon, in compliance with Title 44, Chapter I, Part 67, Section 67.11, Code of Federal Regulations (CFR). This section requires that notice of final flood elevations shall be sent to the Chief Executive Officer of the community, all individual appellants, and the State Coordinating Agency, and shall be published in the *Federal Register*.

On February 19, 1987, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issued a Flood Insurance Rate Map (FIRM) that identified the Special Flood Hazard Areas (SFHAs), the areas subject to inundation by the base (1-percent-annual-chance) flood, in your community. Recently, FEMA completed a re-evaluation of flood hazards in your community. On September 28, 2007, FEMA provided you with Preliminary copies (and with Revised Preliminary copies on December 4, 2009) of the FIRM and Flood Insurance Study (FIS) report that identify existing flood hazards in your community, including Base Flood Elevations (BFEs). The proposed BFEs for your community were published in the *The Times* on October 25, 2012 and November 1, 2012, and in the *Federal Register*, at Part 67, Volume 77, Pages 21516 through 21521, on April 10, 2012.

The statutory 90-day appeal period, which was initiated on the second newspaper publication date cited above, has ended. FEMA did not receive any appeals of the proposed BFEs during that time. Accordingly, the BFEs for your community are considered final. The final rule for BFEs will be published in the *Federal Register* as soon as possible. The FIRM for your community will become effective on November 4, 2016. Before the effective date, FEMA will send you final printed copies of the FIRM and FIS report.

Because the FIS report establishing the BFEs for your community has been completed, certain additional requirements must be met under Section 1361 of the National Flood Insurance Act of 1968, as amended, within 6 months from the date of this letter. Prior to November 4, 2016, your community is required, as a condition of continued eligibility in the National Flood Insurance Program (NFIP), to adopt or show evidence of adoption of floodplain management regulations that meet the standards of Paragraph 60.3(d) of the enclosed NFIP regulations (44 CFR 59, etc.) by the effective date of the FIRM. These standards are the minimum requirements and do not supersede any State or local requirements of a more stringent nature.

It must be emphasized that all the standards specified in Paragraph 60.3(d) of the NFIP regulations must be enacted in a legally enforceable document. This includes adoption of the current effective FIRM and FIS report to which the regulations apply and other modifications made by this map revision. Some of the standards should already have been enacted by your community in order to establish initial eligibility in the NFIP. Your community can meet any additional requirements by taking one of the following actions:

1. Amending existing regulations to incorporate any additional requirements of Paragraph 60.3(d);
2. Adopting all the standards of Paragraph 60.3(d) into one new, comprehensive set of regulations; or
3. Showing evidence that regulations have previously been adopted that meet or exceed the minimum requirements of Paragraph 60.3(d).

Communities that fail to enact the necessary floodplain management regulations will be suspended from participation in the NFIP and subject to the prohibitions contained in Section 202(a) of the Flood Disaster Protection Act of 1973 (Public Law 93-234) as amended.

In addition to your community using the FIRM and FIS report to manage development in the floodplain, FEMA will use the FIRM and FIS report to establish appropriate flood insurance rates. On the effective date of the revised FIRM, actuarial rates for flood insurance will be charged for all new structures and substantial improvements to existing structures located in the identified SFHAs. These rates may be higher if structures are not built in compliance with the floodplain management standards of the NFIP. The actuarial flood insurance rates increase as the lowest elevations (including basement) of new structures decrease in relation to the BFEs established for your community. This is an important consideration for new construction because building at a higher elevation can greatly reduce the cost of flood insurance.

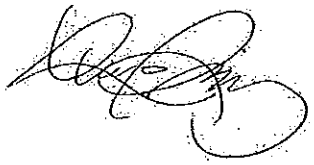
To assist your community in maintaining the FIRM, we have enclosed a Summary of Map Actions to document previous Letter of Map Change (LOMC) actions (i.e., Letters of Map Amendment (LOMAs), Letters of Map Revision (LOMRs)) that will be superseded when the revised FIRM panels referenced above become effective. Information on LOMCs is presented in the following four categories: (1) LOMCs for which results have been included on the revised FIRM panels; (2) LOMCs for which results could not be shown on the revised FIRM panels because of scale limitations or because the LOMC issued had determined that the lots or structures involved were outside the SFHA as shown on the FIRM; (3) LOMCs for which results have not been included on the revised FIRM panels because the flood hazard information on which the original determinations were based are being superseded by new flood hazard information; and (4) LOMCs issued for multiple lots or structures where the determination for one or more of the lots or structures cannot be revalidated through an administrative process like the LOMCs in Category 2 above. LOMCs in Category 2 will be revalidated through a single letter that reaffirms the validity of a previously issued LOMC; the letter will be sent to your community shortly before the effective date of the revised FIRM and will become effective 1 day after the revised FIRM becomes effective. For the LOMCs listed in Category 4, we will review the data previously submitted for the LOMA or LOMR request and issue a new determination for the affected properties after the revised FIRM becomes effective.

The FIRM and FIS report for your community have been prepared in our countywide format, which means that flood hazard information for all jurisdictions within Washington County has been combined into one FIRM and FIS report. When the FIRM and FIS report are printed and distributed, your community will receive only those panels that present flood hazard information for your community. We will provide complete sets of the FIRM panels to county officials, where they will be available for review by your community.

The FIRM panels have been computer-generated. Once the FIRM and FIS report are printed and distributed, the digital files containing the flood hazard data for the entire county can be provided to your community for use in a computer mapping system. These files can be used in conjunction with other thematic data for floodplain management purposes, insurance purchase and rating requirements, and many other planning applications. Copies of the digital files or paper copies of the FIRM panels may be obtained by calling our FEMA Map Information eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). In addition, your community may be eligible for additional credits under our Community Rating System if you implement your activities using digital mapping files.

If your community is encountering difficulties in enacting the necessary floodplain management measures required to continue participation in the NFIP, we urge you to call the Director, Mitigation Division of FEMA in Bothell, Washington, at (425) 487-4600 for assistance. If you have any questions concerning mapping issues in general or the enclosed Summary of Map Actions, please call FMIX at the telephone number shown above. Additional information and resources your community may find helpful regarding the NFIP and floodplain management, such as *The National Flood Insurance Program Code of Federal Regulations, Answers to Questions About the NFIP, Frequently Asked Questions Regarding the Effect that Revised Flood Hazards have on Existing Structures, Use of Flood Insurance Study (FIS) Data as Available Data,* and *National Flood Insurance Program Elevation Certificate and Instructions,* can be found on our website at http://www.floodmaps.fema.gov/lfd. Paper copies of these documents may also be obtained by calling FMIX.

Sincerely,



Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

Enclosure:
Final Summary of Map Actions

cc: Community Map Repository
Tony Doran, Engineering Department, City of Tualatin
Dayna Webb, Engineering Department, City of Tualatin

FINAL SUMMARY OF MAP ACTIONS

Community: TUALATIN, CITY OF Community No: 410277

To assist your community in maintaining the Flood Insurance Rate Map (FIRM), we have summarized below the previously issued Letter of Map Change (LOMC) actions (i.e., Letters of Map Revision (LOMRs) and Letters of Map Amendment (LOMAs)) that will be affected when the revised FIRM becomes effective on November 4, 2016.

1. LOMCs Incorporated

The modifications effected by the LOMCs listed below will be reflected on the revised FIRM. In addition, these LOMCs will remain in effect until the revised FIRM becomes effective.

LOMC	Case No.	Date Issued	Project Identifier	Old Panel	New Panel
			NO CASES RECORDED		

2. LOMCs Not Incorporated

The modifications effected by the LOMCs listed below will not be reflected on the revised FIRM panels because of scale limitations or because the LOMC issued had determined that the lot(s) or structure(s) involved were outside the Special Flood Hazard Area, as shown on the FIRM. These LOMCs will remain in effect until the revised FIRM becomes effective. These LOMCs will be revalidated free of charge 1 day after the revised FIRM becomes effective through a single revalidation letter that reaffirms the validity of the previous LOMCs.

LOMC	Case No.	Date Issued	Project Identifier	Old Panel	New Panel
LOMA	95-R10-109	05/05/1995	UNKNOWN	4102770000	41067C0544E
LOMA	96-R10-092	01/23/1996	TRACT 5, TUALATIN COMMONS IN SECTION 24, T 25, R1W	4102770002D	41067C0544E
LOMA	98-10-201A	05/15/1998	19300 SW BOONES FERRY ROAD--A PORTION OF SECTION 24, T2S, R1W, W.M.	4102770002D	41067C0544E
LOMA	98-10-484A	11/02/1998	19255 SW 65TH AVE-- A PORTION OF SECTION 24, T2S, R1W, W.M.	4102770002D	41067C0563E
LOMA	00-10-088A	01/10/2000	19300 SW BOONES FERRY ROAD -- PORTION OF SECTION 24, T2S, R1W, W.M.	4102770002D	41067C0544E
LOMR-F	00-10-086A	01/28/2000	HEDGES GREENE APT. HOMES, BLDGS. 1-17 & CLUBHOUSE -- 8900 SW SWEEK DRIVE	4102770002D	41067C0544E
LOMA	03-10-0199A	02/04/2003	FOX HILL III, LOT 152 -- 19095 SW MOBILE PLACE	4102770002D	41067C0563E
LOMA	04-10-0837A	10/29/2004	STONES THROW APARTMENTS -- 6455 SW NYBERG LANE, PORTION OF SECTION 19, T2S, R1E, W.M.	4102770002D	41067C0563E

FINAL SUMMARY OF MAP ACTIONS

Community: TUALATIN, CITY OF Community No: 410277

LOMC	Case No.	Date Issued	Project Identifier	Old Panel	New Panel
LOMR-F	04-10-0868A	11/17/2004	LIBERTY OAKS TOWNHOMES, LOT 86 -- 9279 CASCARA LANE	4102770002D	41067C0544E
LOMA	04-10-0815A	01/10/2005	EMERY ZIDELL COMMONS, LOTS 3-4	4102770002D	41067C0544E
LOMA	05-10-0563A	07/01/2005	LIBERTY OAKS TOWNHOMES, LOT 39 -- 18608 SW 92ND TERRACE	4102770002D	41067C0544E
LOMA	12-10-1585X	10/11/2012	FOX HILL III, LOT 172 -- 5585 SOUTHWEST OMAHA COURT	4102770002D	41067C0563E
LOMA	13-10-0445A	01/15/2013	5916 SOUTHWEST NYBERG LANE (BUILDING B)	4102770002D	41067C0563E
LOMA	13-10-0462A	01/15/2013	5916 SOUTHWEST NYBERG LANE (BUILDINGS C & D)	4102770002D	41067C0563E
LOMA	13-10-0526A	02/12/2013	LOT 163, FOX HILL III -- 19025 SOUTHWEST 57TH AVENUE	4102770002D	41067C0563E
LOMR-F	13-10-0848A	04/09/2013	10300 SOUTHWEST HERMAN ROAD, 10350 SOUTHWEST HERMAN ROAD & 10360 SOUTHWEST SPOKANE COURT	4102770001D	41067C0543E
LOMA	15-10-1183A	07/15/2015	Lot 16 and part 1, Premier Industrial Park Subdivision - 19400 SW Teton Ave	4102770001D	41067C0543E

3. LOMCs Superseded

The modifications effected by the LOMCs listed below have not been reflected on the Final revised FIRM panels because they are being superseded by new detailed flood hazard information or the information available was not sufficient to make a determination. The reason each is being superseded is noted below. These LOMCs will no longer be in effect when the revised FIRM becomes effective.

LOMC	Case No.	Date Issued	Project Identifier	Reason Determination Will be Superseded
LOMR-F	199104531FIA	12/14/1988	STONES THROW APARTMENTS	4
LOMR-F	199107109FIA	09/26/1991	POR. LOT 14,15& VACATED CHESAPEAKE DR.	4
LOMR-F	98-10-318A	07/23/1998	TETON PARK, PHASE 1, BLDGS 10-A, 10-B, & 10-C, PREMIER INDUSTRIAL PARK, LOTS 9-10 -- 19155 SW TETON	4
LOMR-F	98-10-469A	12/31/1998	PARCEL 3; 10255 SW SPOKANE CT.	2
LOMR-F	01-10-152A	02/09/2001	PREMIER INDUSTRIAL PARK, PARCEL 3 -- 19201 SW TETON AVENUE	2

FINAL SUMMARY OF MAP ACTIONS

Community: TUALATIN, CITY OF Community No: 410277

LOMC	Case No.	Date Issued	Project Identifier	Old Panel	New Panel
LOMR-F	04-10-0868A	11/17/2004	LIBERTY OAKS TOWNHOMES, LOT 86 -- 9279 CASCARA LANE	4102770002D	41067C0544E
LOMA	04-10-0815A	01/10/2005	EMERY ZIDELL COMMONS, LOTS 3-4	4102770002D	41067C0544E
LOMA	05-10-0563A	07/01/2005	LIBERTY OAKS TOWNHOMES, LOT 39 -- 18608 SW 92ND TERRACE	4102770002D	41067C0544E
LOMA	12-10-1585X	10/11/2012	FOX HILL III, LOT 172 -- 5585 SOUTHWEST OMAHA COURT	4102770002D	41067C0563E
LOMA	13-10-0445A	01/15/2013	5916 SOUTHWEST NYBERG LANE (BUILDING B)	4102770002D	41067C0563E
LOMA	13-10-0462A	01/15/2013	5916 SOUTHWEST NYBERG LANE (BUILDINGS C & D)	4102770002D	41067C0563E
LOMA	13-10-0526A	02/12/2013	LOT 163, FOX HILL III -- 19025 SOUTHWEST 57TH AVENUE	4102770002D	41067C0563E
LOMR-F	13-10-0848A	04/09/2013	10300 SOUTHWEST HERMAN ROAD, 10350 SOUTHWEST HERMAN ROAD & 10360 SOUTHWEST SPOKANE COURT	4102770001D	41067C0543E
LOMA	15-10-1183A	07/15/2015	Lot 16 and part 1, Premier Industrial Park Subdivision - 19400 SW Teton Ave	4102770001D	41067C0543E

3. LOMCs Superseded

The modifications effected by the LOMCs listed below have not been reflected on the Final revised FIRM panels because they are being superseded by new detailed flood hazard information or the information available was not sufficient to make a determination. The reason each is being superseded is noted below. These LOMCs will no longer be in effect when the revised FIRM becomes effective.

LOMC	Case No.	Date Issued	Project Identifier	Reason Determination Will be Superseded
LOMR-F	199104531FIA	12/14/1988	STONES THROW APARTMENTS	4
LOMR-F	199107109FIA	09/26/1991	POR. LOT 14,15& VACATED CHESAPEAKE DR.	4
LOMR-F	98-10-318A	07/23/1998	TETON PARK, PHASE 1, BLDGS 10-A, 10-B, & 10-C, PREMIER INDUSTRIAL PARK, LOTS 9-10 -- 19155 SW TETON	4
LOMR-F	98-10-469A	12/31/1998	PARCEL 3; 10255 SW SPOKANE CT.	2
LOMR-F	01-10-152A	02/09/2001	PREMIER INDUSTRIAL PARK, PARCEL 3 -- 19201 SW TETON AVENUE	2

FINAL SUMMARY OF MAP ACTIONS

Community: TUALATIN, CITY OF Community No: 410277

LOMC	Case No.	Date Issued	Project Identifier	Reason Determination Will be Superseded
LOMR-F	01-10-455A	10/03/2001	TUALATIN MEADOWS APTS, BLDGS A-L, REC BLDG, GARAGES M-U -- 18755 SW 90TH AVENUE	4
LOMR-F	02-10-175A	01/31/2002	7550 SW NYBERG STREET, BLDGS 1 & 2 -- PORTION OF SECTION 24, T2S, R1W, W.M.	2
LOMA	03-10-0039A	11/15/2002	FOX HILL III, LOT 155 -- 19000 SW MOBIL PLACE	4
LOMR-F	05-10-0093A	12/28/2004	TETON PARK PHASE 1, BLDG 10B -- 19095 SW TETON AVENUE	2
LOMA	05-10-0470A	05/26/2005	19450 SW CIPOLE ROAD -- PORTION OF SECTION 21, T2S, R1W, W. M.	4
LOMR	10-10-0006P	05/10/2010	Riverhouse Commons Bridge	4
LOMA	10-10-0833A	07/22/2010	TUALATIN GREENS CONDOMINIUMS -- 8720 SOUTHWEST TUALATIN ROAD	2
LOMA	11-10-0922A	05/12/2011	LOT 3, PACIFIC STATES INDUSTRIAL PARK -- 9650 SOUTHWEST HERMAN ROAD	4

1. Insufficient information available to make a determination.
2. Lowest Adjacent Grade and Lowest Finished Floor are below the proposed Base Flood Elevation.
3. Lowest Ground Elevation is below the proposed Base Flood Elevation.
4. Revised hydrologic and hydraulic analyses.
5. Revised topographic information.

4. LOMCs To Be Redetermined

The LOMCs in Category 2 above will be revalidated through a single revalidation letter that reaffirms the validity of the determination in the previously issued LOMC. For LOMCs issued for multiple lots or structures where the determination for one or more of the lots or structures has changed, the LOMC cannot be revalidated through this administrative process. Therefore, we will review the data previously submitted for the LOMC requests listed below and issue a new determination for the affected properties after the effective date of the revised FIRM.

LOMC	Case No.	Date Issued	Project Identifier	Old Panel	New Panel
			NO CASES RECORDED		

U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472

FEMA

JUL 22 2016

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

REC'D
CITY OF TUALATIN
JUL 25 2016
MAYOR__COUNCIL__POLICE__ADM__
FINANCE__COMM DEV__LEGAL__OPER__
COMM SVCS__ENG & BLDG__LIBRARY__

The Honorable Lou Ogden
Mayor, City of Tualatin
18880 Southwest Martinazzi Avenue
Tualatin, Oregon 97062

Dear Mayor Ogden:

I commend you for the efforts that have been put forth in implementing the floodplain management measures for the City of Tualatin, Oregon, to participate in the National Flood Insurance Program (NFIP). As you implement these measures, I want to emphasize the following:

- a Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) have been completed for your community;
- the FIS and FIRM will become effective on November 4, 2016; and
- by the FIS and FIRM effective date, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) Regional Office is required to approve the legally enforceable floodplain management measures your community adopts in accordance with Title 44 Code of Federal Regulations Section 60.3(d).

As noted in FEMA's letter dated May 4, 2016, no significant changes have been made to the flood hazard data on the Preliminary and/or revised Preliminary copies of the FIRM for Washington County. Therefore, the City of Tualatin should use the Preliminary and/or revised Preliminary copies of the FIRM as the basis for adopting the required floodplain management measures. Final printed copies of the FIRM for the City of Tualatin will be sent to you within the next few months.

If you encounter difficulties in enacting the measures, I recommend you contact the Department of Land Conservation and Development. You may contact Christine Shirley, CFM, the NFIP State Coordinator, by telephone at (503) 373-0050, in writing at 635 Capitol Street, Northeast, Suite 150, Salem, Oregon 97301-2540, or by electronic mail at christine.shirley@state.or.us.

The FEMA Regional staff in Bothell, Washington, is also available to provide technical assistance and guidance in the development of floodplain management measures. The adoption of compliant floodplain management measures will provide protection for the City of Tualatin and will ensure its participation in the NFIP. The Regional Office may be contacted by telephone at (425) 487-4600 or in writing. Please send your written inquiries to the Director, Federal Insurance and Mitigation Division, FEMA Region X, at 130 - 228th Street, Southwest, Bothell, Washington 98021-8627.

You may have already contacted the NFIP State Coordinator and/or the FEMA Regional Office, and may be in the final adoption process or recently adopted the appropriate measures. However, in the event your community has not adopted the appropriate measures, this letter is FEMA's official notification that you only have until November 4, 2016, to adopt and/or submit a floodplain management ordinance that meets or exceeds the minimum NFIP requirements, and request approval from the FEMA Regional Office by the effective date. Your community's adopted measures will be reviewed upon receipt and the FEMA Regional Office will notify you when the measures are approved.

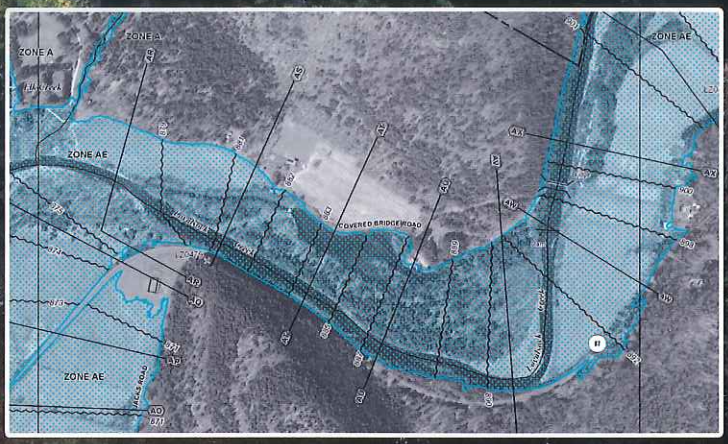
I appreciate your cooperation to ensure that your community's floodplain management measures are approved by the FEMA Regional Office by November 4, 2016. Your compliance with these mandatory program requirements will enable your community to avoid suspension from the NFIP.

Sincerely,



Rachel Sears, Director
Floodplain Management Division
Mitigation Directorate | FEMA

cc: Kenneth Murphy, Regional Administrator, FEMA Region X
Christine Shirley, CFM, NFIP State Coordinator, Department of Land Conservation and Development
Tony Doran, EIT, Engineering Associate, City of Tualatin





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Adoption of Flood Insurance Rate Maps by Participating Communities

The National Flood Insurance Program (NFIP) was established with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Over 21,000 communities participate in the Program.

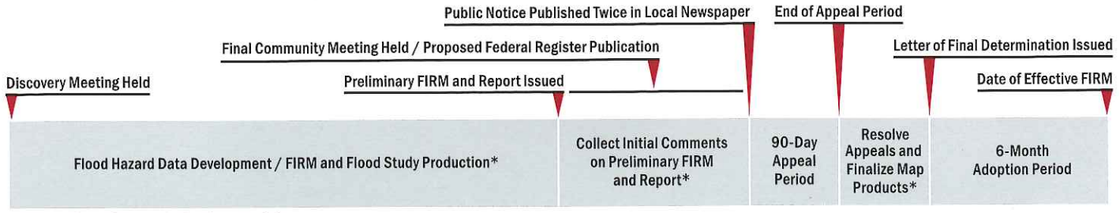
This brochure addresses several questions about community adoption of the Flood Insurance Rate Map (FIRM). As a participating community in the NFIP, your community is responsible for making sure that its floodplain management regulations meet or exceed the minimum requirements of the NFIP. By law, the Department of Homeland Security's Federal Emergency Management Agency (FEMA) cannot offer flood insurance in communities that do not have regulations that meet or exceed these minimum requirements. These regulations can be found in **Title 44** of the **Code of Federal Regulations (44 CFR) Section 60.3**. You can also find them in model ordinances developed by most States and by FEMA Regional Offices.

The basis of your community's floodplain management regulations is the flood hazard data provided to the community by FEMA. FEMA identifies flood hazards nationwide and publishes and periodically updates flood hazard data in support of the NFIP. Flood hazard data is provided to communities in the form of a FIRM and Flood Insurance Study (FIS) report, typically prepared in a countywide format. Please be aware that while an FIS report accompanies most FIRMs, it is not created for all flood studies.

The identification of flood hazards serves many important purposes. Identifying flood hazards creates an awareness of the hazard, especially for those who live and work in floodprone areas. The FIRM and FIS report provide States and communities with the information needed for land use planning and to reduce flood risk to floodplain development and implement other health and safety requirements through codes and regulations. States and communities can also use the information for emergency management.

Each time FEMA provides your community with additional flood hazard data, your community must adopt new floodplain management regulations or amend existing regulations to incorporate the new data and meet any additional requirements that result from any changes in the data, such as the designation of a regulatory floodway for the first time. Your floodplain management regulations must also meet any additional State requirements and be adopted through a process that complies with any procedural requirements established in your State for the adoption of ordinances or regulations.

Flood Study and Adoption Timeline



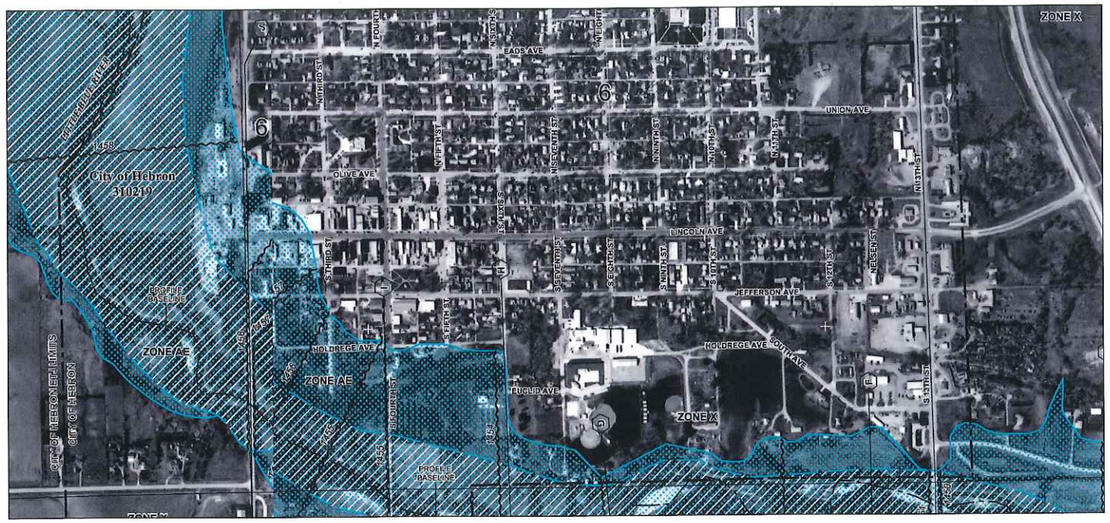
**The timeframe for completing these activites may vary.*

What is the process for developing new flood hazard data or revising existing data?

FEMA coordinates closely with communities to develop new flood risk data or revise existing data during the flood study process. This coordination may lead to new or updated flood hazard mapping (i.e., the update of a community's FIRM and FIS report), flood risk assessment projects, and/or mitigation planning assistance. In general, the process includes the following activities:

- Under FEMA's Risk MAP program, FEMA engages in a Discovery process with communities and other local stakeholders to obtain a comprehensive picture of flooding issues, flood risk, and the potential for the performance of additional flood mitigation activities, including the adoption of more restrictive floodplain management criteria by communities. Stakeholders may include, but are not limited to, local officials, citizen associations, representatives of levee boards, conservation districts, Tribal Nations, and economic development organizations. Information obtained during the Discovery meeting helps determine whether a flood risk assessment project, including new or updated flood hazard data and a corresponding FIRM and FIS report, is needed.
- Once it is determined that the creation or revision of flood hazard data, including an update to the FIRM and FIS report, is needed, FEMA works with communities and other Discovery stakeholders to determine the parameters of the project, including flooding sources and the type and extent (number of stream or coastline miles) of the study.
- The mapping process typically includes development of Base Flood Elevations (BFEs) and floodways for the project area. In addition, the mapping process includes activities such as obtaining the digital base map, developing the FIRM flood hazard database and, when appropriate, incorporating or revalidating previously issued Letters of Map Change, or LOMCs. LOMCs, which include Letters of Map Revision (LOMRs), Letters of Map Revision Based on Fill and Letters of Map Amendment, serve to officially revise the effective FIRM and FIS report without requiring the physical revision and republication of these materials.
- When the study is completed, FEMA provides the community with a preliminary FIRM and FIS report for review. In addition, FEMA may hold public meetings—often referred to as the Final Meeting and Open House—to explain and obtain comments on the preliminary FIRM and FIS report.
- FEMA provides a 90-day appeal period for all new or modified flood hazard information shown on a FIRM, including additions or modifications of any BFEs, base flood depths, Special Flood Hazard Area (SFHA) boundaries or zone designations, or regulatory floodways. SFHAs are areas subject to inundation by the base (1-percent-annual-chance) flood and include the following flood zones: A, AO, AH, A1-A30, AE, A99, AR, AR/A1-A30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-V30, VE, and V. The regulatory floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Before the appeal period is initiated, FEMA will publish a notice of proposed flood hazard determinations in the Federal Register and notify the community's Chief Executive Officer of the determination. FEMA will then publish information about the flood hazard determinations at least twice in a local newspaper. The appeal period provides the community and owners or lessees of property in the community an opportunity to submit scientific or technical information if they believe the flood hazard determinations are scientifically or technically incorrect.
- Following the 90-day appeal period, FEMA resolves all appeals and finalizes all changes to the FIRM and FIS report.
- FEMA then issues a Letter of Final Determination (LFD), which establishes the final flood hazard data and the effective date of the new FIRM and FIS report for the community. The LFD also initiates the six-month adoption period during which the community must adopt or amend its floodplain management regulations to reference the new FIRM and FIS report.
- The FIRM and FIS report become effective at the end of the six-month period. The effective date is also the date when flood insurance rates will be based on the new flood data for new construction built after this date. The effective FIRM will be used by Federally insured or regulated lenders to determine if flood insurance is required as a condition of a loan.

FEMA has entered into agreements with nearly 250 communities, States, and regional agencies to be active partners in FEMA's flood hazard mapping program under the Cooperating Technical Partners (CTP) Program. These agencies are participating with FEMA in developing and updating FIRMs. (See the box on the inside of the back cover page for a brief description of the CTP program.)



FIRM

What must an NFIP participating community do when FEMA provides new or revised flood hazard data?

Each time FEMA provides a community with new or revised flood hazard data, the community must either adopt new floodplain management regulations, or amend its existing regulations to reference the new FIRM and FIS report. In some cases, communities may have to adopt additional floodplain management requirements if a new type of flood hazard data is provided, such as a new flood zone (e.g., going from a Zone A without BFEs to a Zone AE with BFEs or going from a Zone AE to a Zone VE – the coastal high hazard area), or with the addition of a regulatory floodway designation.

The following guide is to help you determine whether changes need to be made in your community's floodplain management regulations when a new or revised FIRM and FIS report are provided:

- If the community's floodplain management regulations are compliant with the NFIP requirements when the LFD is issued, the community needs to amend only the map reference section of their floodplain management regulations to identify the new FIRM and FIS report.
- If the community has a legally valid automatic adoption clause established in the map reference section of the regulations and the community's regulations are otherwise compliant with the NFIP requirements, then the floodplain management regulations do not need to be amended. Automatic adoption clauses adopt all future revisions to the FIRM without further action by the community. However, keep in mind that the FIRM and FIS report update process outlined above still applies for communities with automatic adoption clauses. Automatic adoption clauses are not permitted in many States.
- If the community is provided a new type of flood hazard data, the community will need to either adopt new regulations or amend existing regulations to include the appropriate NFIP requirements, in addition to referencing the new FIRM and FIS report.

The LFD indicates the sections of the NFIP floodplain management requirements at 44 CFR Section 60.3 that a community must adopt based on the type of flood hazard data provided to the community.

You can contact the FEMA Regional Office or your State NFIP Coordinating Agency for assistance on the specific requirements your community will need to adopt. (See "For Assistance" on the back cover page for contact information.)

If your community has adopted higher standards than the minimum requirements of the NFIP, your community may qualify for a reduction in flood insurance premiums for your citizens under the Community Rating System (CRS). (See the box on the inside of the back cover for a brief description of the CRS.)



Janesville, Wisconsin, 2008

When must a community adopt the new or revised flood hazard data?

Your community must amend its existing floodplain management regulations or adopt new regulations before the effective date of the FIRM and FIS report, which is identified in the LFD. The LFD initiates the six-month adoption period.

Communities are encouraged to adopt the appropriate floodplain management regulations as soon as possible after the LFD is issued. The adopted regulations must be submitted to FEMA or the State and be approved by FEMA before the effective date of the FIRM and FIS report.

FEMA will send two letters notifying the community that it must have approved floodplain management regulations in place before the effective date of the FIRM. The first letter is a reminder letter and is sent to the community 90 days before the effective date. The second letter is sent to the community 30 days before the effective date of the FIRM. This letter is FEMA's final notification that the community will be suspended from the NFIP if it does not adopt the FIRM before the effective date. Notice of the suspension is also published in the *Federal Register*.

If the community adopts or amends its floodplain management regulations prior to the effective date of the FIRM and FIS report and the FEMA Regional Office approves the community's regulations, the suspension will not go into effect and the community will remain eligible for participation in the NFIP.

What happens if a community does not adopt the appropriate floodplain management regulations during the six-month adoption period?

If a community does not adopt new floodplain management regulations or amend its existing regulations before the effective date of the FIRM and FIS report, the community will be suspended from the NFIP.

The following sanctions apply if a community is suspended from the NFIP:

- Property owners will not be able to purchase NFIP flood insurance policies and existing policies will not be renewed.
- Federal grants or loans for development will not be available in identified flood hazard areas under programs administered by Federal agencies such as the Department of Housing and Urban Development, the Environmental Protection Agency, and the Small Business Administration.
- Federal disaster assistance will not be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood.
- Federal mortgage insurance or loan guarantees will not be provided in identified flood hazard areas such as those written by the Federal Housing Administration and the Department of Veteran Affairs.
- Federally insured or regulated lending institutions, such as banks and credit unions, are allowed to



Elevated home on pile foundation



Elevated home on crawl space foundation

make conventional loans for insurable buildings in flood hazard areas of non-participating communities. However, the lender must notify applicants that the property is in a flood hazard area and that the property is not eligible for Federal disaster assistance. Some lenders may voluntarily choose not to make these loans.

If a community is suspended, it may regain its eligibility in the NFIP by enacting the floodplain management measures established in 44 CFR Section 60.3 of the NFIP regulations. If development takes place in your community during suspension that does not meet the minimum NFIP requirements, your community will be asked to take actions to reduce the increased flood hazard prior to reinstatement.

Digital Flood Hazard Information Resources

In accordance with the Flood Insurance Reform Act of 2004, FEMA has implemented a policy that allows the use of digital data for official NFIP purposes. All FEMA's flood mapping products are now prepared digitally, and a number of different digital options are available to view the flood hazard information shown on community FIRMs. All digital flood hazard resources referenced below can be accessed through FEMA's Map Service Center (MSC) at http://msc.fema.gov.

- Once effective, copies of the FIRM panels in digital format will be provided to your community and will also be available through the MSC. Note that Letters of Map Change (LOMCs) are also available through the MSC in .pdf format.
- FIRMettes show a desired section of a FIRM panel specified by a user, plus map scale, and other legend information from the FIRM. FIRMettes can be created online through the MSC, and printed or saved in .pdf format at no cost.
- The FIRM database is designed for use with specialized Geographic Information System (GIS) software. Users are able to integrate local data sets with the FEMA flood hazard data in the FIRM database to assist with floodplain management or mitigation planning measures. The FIRM database is provided to your community once the FIRM becomes effective and is also available for download through the MSC.
- The National Flood Hazard Layer (NFHL) contains all effective digital flood hazard information from FIRM databases and LOMRs produced by FEMA in one integrated nationwide dataset. It also contains point locations of other LOMCs, such as Letters of Map Revision Based on Fill and Letters of Map Amendment. The NFHL is available for viewing through FEMA's online map viewer which can be accessed through the MSC. The NFHL can also be viewed as a layer in Google Earth or accessed via Web Map Service (WMS), a web-based method of viewing map information using commercial GIS software, such as ESRI's ArcGIS. Additional information on these services is available through the MSC.

Note for communities that do not yet have digitally produced FIRMs: scanned digital versions of the paper FIRM panels are available through the MSC. However, since the FIRMs were not produced digitally, a FIRM database will not be available and the flood hazard information shown on the FIRMs will not be included in the NFHL.

Becoming a Cooperating Technical Partner

FEMA established the Cooperating Technical Partner (CTP) program to increase local involvement in, and ownership of, the flood study process and the flood hazard data developed as part of that process. This program enables communities, and regional and State agencies that have the interest, capabilities, and resources to be active partners in FEMA's flood hazard mapping program.

One of the major objectives of the CTP program is to recognize States, regional agencies, and communities with proactive floodplain management programs that include identifying the flood risk and getting the information incorporated into official FEMA flood hazard data. The CTP Program maintains national standards consistent with the NFIP Regulations. The following are some of the benefits of being a CTP.

- CTPs are given an opportunity to develop more detailed maps by making local geospatial data a part of the FIRM
- CTPs receive support such as access to existing data, access to custom-made FEMA tools, technical assistance, and national recognition
- CTPs receive mentoring support, online examples of "best practices," and free training
- Communities that participate in the Community Rating System (CRS) that also become CTPs or are in an area covered by a regional or State CTP may be eligible to receive CRS credit for CTP activities

Another major objective and benefit of the CTP Program is the ability to leverage available funding and local data to make the most of limited resources. Communities, States, and regional agencies can take advantage of these benefits by entering into an agreement with FEMA that formalizes the types of mapping activities and support the CTP will provide. Nearly 250 communities, States, and regional agencies are currently participating in the CTP Program.

To learn more about becoming a CTP, visit www.fema.gov/plan/prevent/fhm/ctp_main.shtm or contact your FEMA regional office (see back page for contact information)

Becoming an NFIP Community Rating System Community

The NFIP Community Rating System (CRS) recognizes community floodplain management practices that exceed the minimum requirements of the NFIP. CRS recognizes these efforts by reducing the cost of flood insurance premiums from 5 percent to 45 percent for flood insurance policies in communities that participate in the CRS.

Many communities may already be doing activities that would earn credit under the CRS which would reduce flood insurance premiums for their citizens. Here are a few examples:

- Adopting and enforcing more protective building standards that result in safer new construction
- Informing the public about flood hazards and flood insurance and how to reduce flood damage
- Preserving open space in the floodplain

To receive CRS credit, a community must submit a CRS application to FEMA which identifies floodplain management practices being implemented by the community. FEMA can help with the application. After FEMA reviews and verifies the application, the flood insurance premium discounts will go into effect. The amount of flood insurance policy premium discount depends on the number of CRS-credited activities a community performs.

Community participation in the CRS has many benefits:

- Discounts for flood insurance premiums from 5 percent to 45 percent
- Enhanced public safety
- Reduced flood damage
- Increased environmental protection
- Informed community residents supporting improved flood protection measures that will make communities safer from flood risks.

To learn more about CRS, visit www.fema.gov/business/nfip/crs.shtm or call 317-848-2898

For Assistance

If your community needs assistance in adopting the FIRM, you may contact the FEMA Regional Offices listed below. You may also contact your State Coordinating Agency for the NFIP. Additional information is available at www.fema.gov/rm-main/regional-contact-information.

REGION I
CT, ME, MA, NH, RI, VT
99 High Street, 6th Floor
Boston, MA 02110
617-956-7506

REGION II
NJ, NY, PR, VI
26 Federal Plaza, Suite 1337
New York, NY 10278-0002
212-680-3600

REGION III
DE, DC, MD, PA, VA, WV
615 Chestnut Street
1 Independence Mall, 6th Floor
Philadelphia, PA 19106-4404
215-931-5500

REGION IV
AL, FL, GA, KY, MS, NC, SC, TN
3003 Chamblee-Tucker Road
Atlanta, GA 30341
770-220-5200

REGION V
IL, IN, MI, MN, OH, WI
536 South Clark Street, 6th Floor
Chicago, IL 60605
312-408-5500

REGION VI
AR, LA, NM, OK, TX
Federal Regional Center
800 North Loop 288
Denton, TX 76209-3698
940-898-5399

REGION VII
IA, KS, MO, NE
9221 Ward Parkway, Suite 300
Kansas City, MO 64114-3372
816-283-7061

REGION VIII
CO, MT, ND, SD, UT, WY
Denver Federal Center, Building 710, Box 25267
Denver, CO 80225-0267
303-235-4800

REGION IX
AZ, CA, HI, NV, American Samoa, Guam,
Marshall Islands and Northern Mariana Islands
1111 Broadway, Suite 1200
Oakland, CA 94607
510-627-7100

REGION X
AK, ID, OR, WA
Federal Regional Center
130 228th Street SW
Bothell, WA 98021-8627
425-487-4600

OREGON MODEL
FLOOD DAMAGE PREVENTION ORDINANCE

Effective January 2009
Modified August 2009
Modified January 2014
Modified March 2015

Adoption of this ordinance will ensure compliance with the standards for participation in the National Flood Insurance Program (NFIP). The model includes standards and provisions that encourage sound flood plain management and if implemented allows property owners to obtain flood insurance at a more affordable rate.

Development Permits

NFIP requires that a permit be issued for all development (see DEFINITIONS) in the regulatory floodplain. A floodplain development permit is intended to provide a mechanism for jurisdictions to review all proposed development in the regulatory floodplain. A floodplain development permit is not the same as a building permit.

Association with Building Codes

On October 1, 2014 a new residential building code went into effect that relies on the local flood plain administrator to provide building officials with key information needed to administer the building code in Special Flood Hazard Areas. Specifically, the authority to establish the base flood elevation and any required freeboard rests with the flood plain administrator. Furthermore, the Building Code Division added the following note to the residential code:

> *Local communities may choose to designate their local building official as the Flood Plain Administrator or may designate other staff. When a building official functioning in the capacity of Flood Plain Administrator exercises authority under the NFIP, such decisions are not part of this code nor subject to the building official duties and responsibilities as adopted by the Oregon Building Codes Division.*
>
> *Per ORS 455.210(3(c), local communities are prohibited from using building permit monies for any matter other than administration and enforcement of the State Building Code. Administration and implementation of NFIP requirements are not part of the State Building Code.*

Below-grade Crawlspaces
Below-grade refers to the inside of the crawlspace being below-grade on all sides, similar to how FEMA defines basement. FEMA would prefer that NFIP communities prohibit below-grade crawl spaces in Special Flood Hazard Areas. If, however, your community decides to allow below grade crawl spaces, specific language must be included in your code. The model code contained herein was derived from Technical Bulletin 11-01: Crawlspace Construction for Buildings located in Special Flood Hazard Areas.
If crawlspace standards are not included in local code, FEMA considers crawlspaces to be basements, which are not allowed as new construction or substantial improvements.

Manufactured Dwellings
The 2011 Oregon Manufactured Dwelling and Park Specialty Code requires that manufactured dwellings be elevated such that the bottom of the chassis is at base flood elevation. The Code also requires that electrical cross-over connections be elevated at least 12" above Base Flood Elevation. Furthermore, the Code makes no distinction between existing and new manufactured dwelling parks. All new installations, repair of substantial damage, or substantial improvements must be elevated above the base flood elevation.

Accessory and Agricultural Buildings
Finally, the NFIP requires that accessory structures, including agricultural buildings be elevated or floodproofed. Agricultural buildings located in the Special Flood Hazard Area are not exempt from building codes.

Agricultural Buildings:
ORS 455.315 exempts certain agricultural buildings from application of the Oregon Structural Specialty Code, however, **the exemption does not apply to:**

(A) A dwelling;

(B) A structure used for a purpose other than growing plants in which 10 or more persons are present at any one time;

(C) A structure regulated by the State Fire Marshal pursuant to ORS chapter 476;

(D) A structure used by the public; or

(E) A structure subject to sections 4001 to 4127, title 42, United States Code (the National Flood Insurance Act of 1968) as amended, and regulations promulgated thereunder.

If you have any questions concerning adoption of this model or participation in the NFIP, please contact our Regional Office at (425) 487-4677.

KEY

Items in *underlined italics* (on electronic copies) or *underlined italics* (on paper copies) of the ordinance need to be filled in by the community.

Highlighted text recommended but not required
Blue means V-zone only requirement

OREGON MODEL
FLOOD DAMAGE PREVENTION ORDINANCE

	SECTION 1.0 **AUTHORIZATION, FINDINGS OF FACT, PURPOSE, AND OBJECTIVES**
	1.1 AUTHORIZATION The State of Oregon has delegated[1] the responsibility to local governmental to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the *city/town/county*, does ordain as follows: *{change for tribal government}*
	1.2 FINDINGS OF FACT
	(1) The *{city/ county/tribe}* has the primary responsibility for planning, adoption and enforcement of land use regulations to accomplish proper management of special flood hazard areas. *[44 CFR Part 59.22]*
	(2) The special flood hazard areas of *city/town/county/tribe* are subject to periodic inundation which results in loss of life and property, health, and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.
	(3) These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated, or otherwise protected from flood damage also contribute to the flood loss.
	1.3 STATEMENT OF PURPOSE The purpose of this ordinance to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed. Specific objectives are:
	(1) To protect human life and health;
	(2) To minimize expenditure of public money and costly flood control

[1] Almost all Oregon cities and some Oregon counties will derive their authority to adopt a flood damage prevention ordinance from the home rule provisions of the Oregon Constitution. See Article XI, Section 2 of the Oregon Constitution and your local government charter, if applicable. All counties, including those without home rule charters, have been granted authority to enact ordinances under Oregon Revised Statute 203.035.

	projects;
	(3) To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
	(4) To minimize prolonged business interruptions;
	(5) To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in areas of special flood hazard;
	(6) To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;
	(7) To ensure that potential buyers are notified that property is in an area of special flood hazard; and,
	(8) To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.
	(9) To manage the alteration of special flood hazard areas, stream channels and shorelines to maintain their natural and beneficial functions.
	1.4 METHODS OF REDUCING FLOOD LOSSES In order to accomplish these objectives, this ordinance includes methods and provisions for:
	(1) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
	(2) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
	(3) Controlling the alteration of natural flood plains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
	(4) Controlling filling, grading, dredging, and other development which may increase flood damage;
	(5) Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or may increase flood hazards in other areas.

	SECTION 2.0 **DEFINITIONS** Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.
	"APPEAL" means a request for a review of the interpretation of any provision of this ordinance or a request for a variance.
	"AREA OF SHALLOW FLOODING" means a designated AO, or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow and AH indicates ponding.
	"AREA OF SPECIAL FLOOD HAZARD" means the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.
	"BASE FLOOD" means the flood having a one percent chance of being equaled or exceeded in any given year. Also referred to as the "100-year flood." Designation on maps always includes the letters A or V.
	"BASEMENT" means any area of the building having its floor subgrade (below ground level) on all sides.
	"BELOW-GRADE CRAWL SPACE" means an enclosed area below the base flood elevation in which the interior grade is not more than two feet below the lowest adjacent exterior grade and the height, measured from the interior grade of the crawlspace to the top of the crawlspace foundation, does not exceed 4 feet at any point ***Note: this definition and appropriate crawlspace code must be included in the flood hazard development ordinance if below grade crawlspaces are allowed, otherwise below grade crawlspaces will be considered to be basements. Structures built with below grade crawlspaces will have higher insurance premiums.***
	"BREAKAWAY WALL" means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.
	"COASTAL HIGH HAZARD AREA" means an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1-V30, VE or V.

NEW	"CONDITIONAL LETTER OF MAP REVISION (CLOMR)" means a letter from FEMA commenting on whether a proposed project, if built as proposed, would meet the minimum NFIP standards or proposed hydrology changes.
	"CRITICAL FACILITY" means a facility for which even a slight chance of flooding might be too great. Critical facilities include, but are not limited to schools, nursing homes, hospitals police, fire and emergency response installations, installations which produce, use or store hazardous materials or hazardous waste.
	"DEVELOPMENT" means any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials located within the area of special flood hazard.
	"ELEVATED BUILDING" means for insurance purposes, a nonbasement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, post, piers, pilings, or columns.
	"FLOOD" OR "FLOODING" means a general and temporary condition of partial or complete inundation of normally dry land areas from: (1) The overflow of inland or tidal waters and/or (2) The unusual and rapid accumulation of runoff of surface waters from any source.
	"FLOOD INSURANCE RATE MAP (FIRM)" means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
	"FLOOD INSURANCE STUDY" means the official report provided by the Federal Insurance Administration that includes flood profiles, the Flood Boundary-Floodway Map, and the water surface elevation of the base flood.
	"FLOODWAY" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.
NEW	"HIGHEST ADJACENT GRADE" means the highest natural elevation of the ground surface prior to construction, adjacent to the proposed walls of a structure.

NEW	"HISTORIC STRUCTURE" means a structure that is: (1) Listed individually in the National Register of Historic Places (a listing maintained by the U.S. Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; (2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or to a district preliminarily determined by the Secretary to qualify as a registered historic district; (3) Individually listed on a state inventory of historic places which have been approved by the Secretary of the Interior, or; (4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: i. by an approved state program as determined by the Secretary of the Interior, or; ii. directly by the Secretary of the Interior in states without approved programs. *[Note: Oregon has an approved state program]*

NEW	"LETTER OF MAP CHANGE (LOMC)" means an official FEMA determination, by letter, to amend or revise effective Flood Insurance Rate Maps and/or Flood Insurance Studies. LOMCs are issued in the following categories: (1) Letter of Map Amendment (LOMA) An amendment to the Flood Insurance Rate Maps based on technical data showing that an existing structure or parcel of land that has not been elevated by fill (natural grade) was inadvertently included in the special flood hazard area because of an area of naturally high ground above the base flood. (2) Letter of Map Revision (LOMR) i. LOMR-F (Letter of Map Revision based on Fill) is a letter from FEMA stating that an existing structure or parcel of land that has been elevated by fill would not be inundated by the base flood. ii. A LOMR revises the current Flood Insurance Rate Map and/or Flood Insurance Study to show changes to the floodplains, Floodways or flood elevations. LOMRs are generally based on manmade alterations that affected the hydrologic or hydraulic characteristics of a flooding source and thus result in modification to the existing regulatory Floodway, the effective Base Flood Elevation, or the Special Flood Hazard Area. It is recommended a Conditional Letter of Map Revision be approved by FEMA prior to issuing a permit to start a project if the project has a potential to affect the special flood hazard area. (See Conditional Letter of Map Revision)
	"LOWEST FLOOR" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance found at Section 5.2-1(2).
	"MANUFACTURED DWELLING" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured dwelling" does not include a "recreational vehicle."

	"MANUFACTURED HOME PARK OR SUBDIVISION" means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
	"NEW CONSTRUCTION" means structures for which the "start of construction" commenced on or after the effective date of this ordinance.
	"RECREATIONAL VEHICLE" means a vehicle which is: (1) Built on a single chassis; (2) 400 square feet or less when measured at the largest horizontal projection; (3) Designed to be self-propelled or permanently towable by a light duty truck; and (4) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.
	"START OF CONSTRUCTION" includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.
	"STRUCTURE" means a walled and roofed building, a modular or temporary building, or a gas or liquid storage tank that is principally above ground.
	"SUBSTANTIAL DAMAGE" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

	"SUBSTANTIAL IMPROVEMENT" means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either: (1) Before the improvement or repair is started; or (2) If the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (2) Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.
	"VARIANCE" means a grant of relief from the requirements of this ordinance which permits construction in a manner that would otherwise be prohibited by this ordinance.
	"WATER DEPENDENT" means a structure for commerce or industry which cannot exist in any other location and is dependent on the water by reason of the intrinsic nature of its operations.

	SECTION 3.0
	GENERAL PROVISIONS
	3.1 LANDS TO WHICH THIS ORDINANCE APPLIES This ordinance shall apply to all areas of special flood hazards within the jurisdiction of *city/town/county/tribe*.
	3.2 BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for the *city/town/county/tribe – use county if FIRMs are in countywide format*," dated *month day*, 20*yr*, with accompanying Flood Insurance Maps are hereby adopted by reference and declared to be a part of this ordinance. The Flood Insurance Study is on file at *location*. The best available information for flood hazard area identification as outlined in Section 4.3-2 shall be the basis for regulation until a new FIRM is issued which incorporates the data utilized under section 4.3-2. *Note: Jurisdictions may regulate a larger area than that depicted on the FIRM. Any larger area (such as an historic inundation area) must be identified in this ordinance. Add the expanded area description to this section.*
	3.3 PENALTIES FOR NONCOMPLIANCE No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this ordinance and other applicable regulations. Violations of the provisions of this ordinance by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions) shall constitute a misdemeanor. Any person who violates this ordinance or fails to comply with any of its requirements shall upon conviction thereof be fined not more than *$ amount* or imprisoned for not more than *number* days, or both, for each violation, and in addition shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the *city/town/county/tribe* from taking such other lawful action as is necessary to prevent or remedy any violation.

	3.4 ABROGATION AND SEVERABILITY This ordinance is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this ordinance and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.If any section clause, sentence, or phrase of the Ordinance is held to be invalid or unconstitutional by any court of competent jurisdiction, then said holding shall in no way effect the validity of the remaining portions of this Ordinance.
	3.5 INTERPRETATION In the interpretation and application of this ordinance, all provisions shall be: (1) Considered as minimum requirements; (2) Liberally construed in favor of the governing body; and, (3) Deemed neither to limit or repeal any other powers granted under State statutes.
	3.6 WARNING AND DISCLAIMER OF LIABILITY The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of *city/town/county/tribe*, any officer or employee thereof, or the Federal Insurance Administration, for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

	SECTION 4.0
	ADMINISTRATION
	4.1 ESTABLISHMENT OF DEVELOPMENT PERMIT
	4.1-1 Development Permit Required A development permit shall be obtained before construction or development begins within any area of special flood hazard established in Section 3.2. The permit shall be for all structures including manufactured homes, as set forth in the "DEFINITIONS," and for all development including fill and other activities, also as set forth in the "DEFINITIONS."
	4.1-2 Application for Development Permit Application for a development permit shall be made on forms furnished by the *dept., e.g. Planning, Engineering, etc.* and may include but not be limited to plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. Specifically, the following information is required: (1) Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures; (2) Elevation in relation to mean sea level of floodproofing in any structure; (3) Certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in Section 5.2-2; and (4) Description of the extent to which a watercourse will be altered or relocated as a result of proposed development.
	4.2 DESIGNATION OF THE LOCAL FLOODPLAIN ADMINISTRATOR The _____is hereby appointed to administer and implement this ordinance by granting or denying development permit applications in accordance with its provisions.

	4.3 DUTIES AND RESPONSIBILITIES OF THE LOCAL ADMINISTRATOR Duties of the local administrator shall include, but not be limited to:
NEW	4.3-1 <u>Provide Base Flood Elevation and Freeboard</u> (1) When base flood elevation has been provided in accordance with Section 3.2, BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD, the local floodplain administrator shall provide it to the Building Official along with any freeboard requirements established in Section 5.2 SPECIFIC STANDARDS. (2) When base flood elevation data has not been provided (A and V Zones) in accordance with Section 3.2, BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD, the local floodplain administrator shall obtain, review, and provide any base flood elevation and floodway data available from a Federal, State or other source, in order to administer Sections 5.2, SPECIFIC STANDARDS, and 5.3 FLOODWAYS and the Building Codes.
	4.3-2 <u>Permit Review</u> (1) Review all development permits to determine that the permit requirements of this ordinance have been satisfied. (2) Review all development permits to determine that all necessary permits have been obtained from those Federal, State, or local governmental agencies from which prior approval is required. (3) Review all development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of Section 5.4 are met.

	4.3-3 Information to be Obtained and Maintained (1) Maintain for public inspection all records pertaining to the provisions of this ordinance. (2) Where base flood elevation data is provided through the Flood Insurance Study, FIRM, or required as in Section 4.3-1, obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basements and below-grade crawlspaces) of all new or substantially improved structures, and whether or not the structure contains a basement. (3) For all new or substantially improved floodproofed structures where base flood elevation data is provided through the Flood Insurance Study, FIRM, or as required in Section 4.3-1: (i) Verify and record the actual elevation (in relation to mean seal level), and (ii) Maintain the floodproofing certifications required in Section 4.1-2(3). (4) Maintain for public inspection all records pertaining to the provisions of this ordinance.
(4) NEW	4.3-4 Alteration of Watercourses (1) Development shall not diminish the flood carrying capacity of a watercourse. If any watercourse will be altered or relocated as a result of the proposed development the applicant must submit certification by a registered professional engineer that the flood carrying capacity of the watercourse will not be diminished. (2) Notify adjacent communities, the Department of Land Conservation and Development and other appropriate state and federal agencies, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration. (3) Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished. (4) Applicants shall obtain a Conditional Letter of Map Revision (CLOMR) from FEMA before any encroachment, including fill, new construction, substantial improvement, or other development, in the regulatory floodway is permitted. The applicant shall be responsible for preparing technical data to support the CLOMR application and paying any processing or application fees to FEMA. .

	4.3-5 Requirement to Submit New Technical Data (1) Notify FEMA within six months of project completion when an applicant had obtained a Conditional Letter of Map Revision (CLOMR) from FEMA, or when development altered a watercourse, modified floodplain boundaries, or modified Base Flood Elevations. This notification shall be provided as a Letter of Map Revision (LOMR). (2) The applicant shall be responsible for preparing technical data to support the LOMR application and paying any processing or application fees to FEMA. (3) The Floodplain Administrator shall be under no obligation to sign the Community Acknowledgement Form, which is part of the CLOMR/LOMR application, until the applicant demonstrates that the project will or has met the requirements of this code and all applicable State and Federal laws.
NEW	4-3-6 Non-Conversion of Enclosed Areas below the Lowest Floor To ensure that enclosed areas below the lowest floor continue to be used solely for parking vehicles, limited storage, or access to the building and not be finished for use as human habitation/recreation/bathrooms, etc., the Floodplain Administrator shall: (1) Determine which applicants for new construction and/or substantial improvements have fully enclosed areas below the lowest floor that are 5 feet or higher; (2) Require such applicants to enter into a "NON-CONVERSION DEED DECLARATION FOR CONSTRUCTION WITHIN FLOOD HAZARD AREAS" or equivalent. The deed declaration shall be recorded with *{city, county, tribe}*, and shall be in a form acceptable to the Floodplain Administrator.

	4.3-7 Interpretation of FIRM Boundaries Make interpretations where needed, as to exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in Section 4.4. *If you do not include Section 4.4 (Variance Procedure), end the above sentence after the word "interpretation," and add the following sentence: "such appeals shall be granted consistent with the standards of Section 60.6 of the Rules and Regulations of the National Flood Insurance Program (44 CFR 59-76).*
	4.4 VARIANCE PROCEDURE
	4.4-1 Appeal Board
	(1)The _____ as established by *ordinance* shall hear and decide appeals and requests for variances from the requirements of this ordinance.
	(2)The _____ shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the *city/town/county/tribe* in the enforcement or administration of this ordinance.
	(3)Those aggrieved by the decision of the _____, or any taxpayer, may appeal such decision to the_____, as provided in *ordinance*.

	(4)In passing upon such applications, the _____ shall consider all technical evaluations, all relevant factors, standards specified in other sections of this ordinance, and: (i) The danger that materials may be swept onto other lands to the injury of others; (ii) The danger to life and property due to flooding or erosion damage; (iii) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner; (iv) The importance of the services provided by the proposed facility to the community; (v) The necessity to the facility of a waterfront location, where applicable; (vi) The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage; (vii) The compatibility of the proposed use with existing and anticipated development; (viii) The relationship of the proposed use to the comprehensive plan and flood plain management program for that area; (ix) The safety of access to the property in times of flood for ordinary and emergency vehicles; (x) The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and, (xi) The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, and streets and bridges.
	(5)Upon consideration of the factors of Section 4.4-1(4) and the purposes of this ordinance, the _____ may attach such conditions to the granting of variances as it deems necessary to further the purposes of this ordinance.
	(6)The *local floodplain administrator* shall maintain the records of all appeal actions and report any variances to the Federal Insurance Administration upon request.

	4.4-2 Conditions for Variances
	(1) Generally, the only condition under which a variance from the elevation standard may be issued is for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing items (i-xi) in Section 4.4-1(4) have been fully considered. As the lot size increases the technical justification required for issuing the variance increases.
	(2) Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the National Register of Historic Places or the Statewide Inventory of Historic Propertries, without regard to the procedures set forth in this section.
	(3) Variances shall not be issued within a designated floodway if any increase in flood levels during the base flood discharge would result.
	(4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
	(5) Variances shall only be issued upon: (i) A showing of good and sufficient cause; (ii) A determination that failure to grant the variance would result in exceptional hardship to the applicant; (iii) A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public as identified in Section 4.1-4(4), or conflict with existing local laws or ordinances.
	(6) Variances as interpreted in the National Flood Insurance Program are based on the general zoning law principle that they pertain to a physical piece or property; they are not personal in nature and do not pertain to the structure, its inhabitants, economic or financial circumstances. They primarily address small lots in densely populated residential neighborhoods. As such, variances from the flood elevations should be quite rare.

	(7) Variances may be issued for nonresidential buildings in very limited circumstances to allow a lesser degree of floodproofing than watertight or dry-floodproofing, where it can be determined that such action will have low damage potential, complies with all other variance criteria except 4.4-2(1), and otherwise complies with Sections 5.1-1 through 5.1-3 of the GENERAL STANDARDS.
	(8) Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.
	SECTION 5.0
	PROVISIONS FOR FLOOD HAZARD REDUCTION
	5.1 GENERAL STANDARDS
	5.1-1 Anchoring (1) All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure. (2) All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).
	5.1-2 Construction Materials and Methods (1) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage. (2) All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage. (3) Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

	5.1-3 Utilities (1) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system; (2) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and, (3) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding consistent with the Oregon Department of Environmental Quality.
	5.1-4 Subdivision Proposals (1) All subdivision proposals shall be consistent with the need to minimize flood damage; (2) All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize or eliminate flood damage; (3) All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and, (4) Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments which contain at least 50 lots or 5 acres (whichever is less).
	5.1-5 Review of Building Permits Where elevation data is not available either through the Flood Insurance Study, FIRM, or from another authoritative source (Section 4.3-2), applications for building permits shall be reviewed to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet above grade in these zones may result in higher insurance rates.
	5.1-6 AH Zone Drainage Adequate drainage paths are required around structures on slopes to guide floodwaters around and away from proposed structures.
	5.2 SPECIFIC STANDARDS In all areas of special flood hazards where base flood elevation data has been provided (Zones A1-30, AH, and AE) as set forth in Section 3.2, BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD or Section 4.3-2, Use of Other Base Flood Data (In A and V Zones), the following provisions are required:

	5.2-1 Residential Construction (1) New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to a minimum of one foot above the base flood elevation. (2) Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must be either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria: (i) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. (ii) The bottom of all openings shall be no higher than one foot above grade. (iii) Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.
	5.2-2 Nonresidential Construction (1) Be floodproofed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water; (2) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; (3) Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in Section 4.3-3(2); (4) Nonresidential structures that are elevated, not floodproofed, must meet the same standards for space below the lowest floor as described in 5.2-1(2); (5) Applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the floodproofed level (e.g. a building floodproofed to the base flood level will be rated as one foot below.

	(6) Applicants shall supply a Maintenance Plan for the entire structure to include but not limited to: exterior envelope of structure; all penetrations to the exterior of the structure; all shields, gates, barriers, or components designed to provide floodproofing protection to the structure; all seals or gaskets for shields, gates, barriers, or components; and, the location of all shields, gates, barriers, and components as well as all associated hardware, and any materials or specialized tools necessary to seal the structure. (7) Applicants shall supply an Emergency Action Plan (EAP) for the installation and sealing of the structure prior to a flooding event that clearly identifies what triggers the EAP and who is responsible for enacting the EAP.
	5.2-3 Manufactured Dwellings (1) Manufactured dwellings supported on solid foundation walls shall be constructed with flood openings that comply with 5.1-1(2) above; (2) The bottom of the longitudinal chassis frame beam in A zones, shall be at or above BFE; (3) The manufactured dwelling shall be anchored to prevent flotation, collapse, and lateral movement during the base flood. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques), and; (4) Electrical crossover connections shall be a minimum of 12 inches above BFE.
	5.2-4 Recreational Vehicles Recreational vehicles placed on sites are required to: (1) Be on the site for fewer than 180 consecutive days, and (2) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or (3) Meet the requirements of 5.2-3 above and the elevation and anchoring requirements for manufactured homes.

5.2-5 Small Accessory Structures

Relief from elevation or floodproofing as required in 5.2-1 or 5-2-2 above may be granted for small accessory structures that are:

(1) Less than 200 square feet and do not exceed one story;

(2) Not temperature controlled;

(3) Not used for human habitation and are used solely for parking of vehicles or storage of items having low damage potential when submerged;

(4) Not used to store toxic material, oil or gasoline, or any priority persistent pollutant identified by the Oregon Department of Environmental Quality shall unless confined in a tank installed in compliance with this ordinance or stored at least one foot above Base Flood Elevation

(5) Located and constructed to have low damage potential;

(6) Constructed with materials resistant to flood damage;

(7) Anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of the base flood;

(8) Constructed to equalize hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwater. Designs for complying with this requirement must be certified by a licensed professional engineer or architect or

(i) provide a minimum of two openings with a total net area of not less than one square inch for every square foot of enclosed area subject to flooding;

(ii) the bottom of all openings shall be no higher than one foot above the higher of the exterior or interior grade or floor immediately below the opening;

(iii) openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic flow of floodwater in both directions without manual intervention.

(9) Have electrical, and other service facilities located and installed so as to prevent water from entering or accumulating within the components during conditions of the base flood.

5.2-6 Below-grade crawl spaces

Below-grade crawlspaces are allowed subject to the following standards as found in FEMA Technical Bulletin 11-01, *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*:

(1) The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. Hydrostatic loads and the effects of buoyancy can usually be addressed through the required openings stated in Section B below. Because of hydrodynamic loads, crawlspace construction is not allowed in areas with flood velocities greater than five (5) feet per second unless the design is reviewed by a qualified design professional, such as a registered architect or professional engineer. Other types of foundations are recommended for these areas.

(2) The crawlspace is an enclosed area below the base flood elevation (BFE) and, as such, must have openings that equalize hydrostatic pressures by allowing the automatic entry and exit of floodwaters. The bottom of each flood vent opening can be no more than one (1) foot above the lowest adjacent exterior grade.

(3) Portions of the building below the BFE must be constructed with materials resistant to flood damage. This includes not only the foundation walls of the crawlspace used to elevate the building, but also any joists, insulation, or other materials that extend below the BFE. The recommended construction practice is to elevate the bottom of joists and all insulation above BFE.

(4) Any building utility systems within the crawlspace must be elevated above BFE or designed so that floodwaters cannot enter or accumulate within the system components during flood conditions. Ductwork, in particular, must either be placed above the BFE or sealed from floodwaters.

(5) The interior grade of a crawlspace below the BFE must not be more than two (2)_feet below the lowest adjacent exterior grade.

(6) The height of the below-grade crawlspace, measured from the interior grade of the crawlspace to the top of the crawlspace foundation wall must not exceed four (4) feet at any point. The height limitation is the maximum allowable unsupported wall height according to the engineering analyses and building code requirements for flood hazard areas.

(7) There must be an adequate drainage system that removes floodwaters from the interior area of the crawlspace. The enclosed area should be drained within a reasonable time after a flood event. The type of drainage system will vary because of the site gradient and other drainage characteristics, such as soil types. Possible options include natural drainage through porous, well-drained soils and drainage systems such as perforated pipes, drainage tiles or gravel or crushed stone drainage by gravity or mechanical means.

	5.3 BEFORE REGULATORY FLOODWAY (1) In areas where a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community. (2) Applicants of proposed projects that increase the Base Flood Elevation more than one foot shall obtain from FEMA a Conditional Letter of Map Revision (CLOMR) before the project may be permitted. As soon as possible, but no later than 6 months after project completion, an application for a Letter of Map Revision (LOMR) shall be submitted by the applicant to FEMA. The applicant is responsible for paying any costs associated with the CLOMR and LOMR process.
	5.4 FLOODWAYS Located within areas of special flood hazard established in Section 3.2 are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles, and erosion potential, the following provisions apply: (1) Except as provided in paragraph (3), prohibit encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional civil engineer is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge. (2) If Section 5.4(1) is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Section 5.0, PROVISIONS FOR FLOOD HAZARD REDUCTION.

	(3) Projects for stream habitat restoration may be permitted in the floodway provided: (i) The project qualifies for a Department of the Army, Portland District *Regional General Permit for Stream Habitat Restoration* (NWP-2007-1023); and, (ii) A qualified professional (a Registered Professional Engineer; or staff of NRCS; the county; or fisheries, natural resources, or water resources agencies) has provided a feasibility analysis and certification that the project was designed to keep any rise in 100-year flood levels as close to zero as practically possible given the goals of the project; and, (iii) No structures would be impacted by a potential rise in flood elevation; and, (iv) An agreement to monitor the project, correct problems, and ensure that flood carrying capacity remains unchanged is included as part of the local approval.
	(4) Temporary structures placed in the floodway: Relief from no-rise evaluation, elevation or dry flood-proofing standards may be granted for a non-residential structure placed during the dry season (June – October) and for a period of less than 90 days. A plan for the removal of the temporary structure after the dry season or when a flood event threatens shall be provided. The plan shall include disconnecting and protecting from water infiltration and damage all utilities servicing the temporary structure.
	(5) Temporary storage of goods and materials, not including hazardous materials, is allowed in the floodway for a period of less than 90 days within the dry season (June – October).
	5.5 STANDARDS FOR SHALLOW FLOODING AREAS (AO ZONES) Shallow flooding areas appear on FIRMs as AO zones with depth designations. The base flood depths in these zones range from 1 to 3 feet above ground where a clearly defined channel does not exist, or where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is usually characterized as sheet flow. In these areas, the following provisions apply:
	(1) New construction and substantial improvements of residential structures and manufactured homes within AO zones shall have the lowest floor (including basement) elevated above the highest grade adjacent to the building, a minimum of one foot above the depth number specified on the FIRM (at least two feet if no depth number is specified).

	(2) New construction and substantial improvements of nonresidential structures within AO zones shall either: (i) Have the lowest floor (including basement) elevated above the highest adjacent grade of the building site, one foot or more above the depth number specified on the FIRM (at least two feet if no depth number is specified); or (ii) Together with attendant utility and sanitary facilities, be completely flood proofed to or above that level so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. If this method is used, compliance shall be certified by a registered professional engineer or architect as in section 5.2-2(3).
	(3) Require adequate drainage paths around structures on slopes to guide floodwaters around and away from proposed structures.
	(4) Recreational vehicles placed on sites within AO Zones on the community's FIRM either: (i) Be on the site for fewer than 180 consecutive days, and (ii) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or (iii) Meet the requirements of 5.5 above and the elevation and anchoring requirements for manufactured homes.

	5.6 COASTAL HIGH HAZARD AREAS Located within areas of special flood hazard established in Section 3.2 are Coastal High Hazard Areas, designated as Zones V1-V30, VE and/or V. These areas have special flood hazards associated with high velocity waters from surges and, therefore, in addition to meeting all provisions in this ordinance the following provisions shall also apply:
	(1) All new construction and substantial improvements in Zones V1-V30 and VE (V if base flood elevation data is available) shall be elevated on pilings and columns so that: (i) The bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated a minimum of one foot above the base flood level; and (ii) The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Wind and water loading values shall each have a one percent chance of being equaled or exceeded in and given year (100-year mean recurrence interval);
	(2) A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of (i) and (ii) of this Section.
	(3) Obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures in Zones V1-30, VE, and V, and whether or not such structures contain a basement. The local administrator shall maintain a record of all such information.
	(4) All new construction shall be located landward of the reach of mean high tide.

	(5) Provide that all new construction and substantial improvements have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purpose of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions: (i) Breakaway wall collapse shall result from water load less than that which would occur during the base flood; and (ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).
	(6) If breakaway walls are utilized, such enclosed space shall be useable solely for parking of vehicles, building access, or storage. Such space shall not be used for human habitation.
	(7) Prohibit the use of fill for structural support of buildings.
	(8) Prohibit man-made alteration of sand dunes which would increase potential flood damage.
	(9) All manufactured homes to be replaced or substantially improved within Zones V1-V30, V, and VE on the community's FIRM shall meet the standards of paragraphs 5.6(1) through (8) of this section.

	(10) Recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either: (i) Be on the site for fewer than 180 consecutive days, (ii) Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or (iii) Meet the requirements of Section 4.1-1(Permitting requirements) and paragraphs 5.6(1) through (8) of this section.
	5.7 CRITICAL FACILITY Construction of new critical facilities shall be, to the extent possible, located outside the limits of the Special Flood Hazard Area (SFHA) (100-year floodplain). Construction of new critical facilities shall be permissible within the SFHA if no feasible alternative site is available. Critical facilities constructed within the SFHA shall have the lowest floor elevated three feet above BFE or to the height of the 500-year flood, whichever is higher. Access to and from the critical facility should also be protected to the height utilized above. Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters. Access routes elevated to or above the level of the base flood elevation shall be provided to all critical facilities to the extent possible.

ORDINANCE NO. 1397-16

AN ORDINANCE RELATING TO THE FLOODPLAIN DISTRICT AND AMENDING TUALATIN DEVELOPMENT CODE CHAPTER 70 TO ADOPT FEDERAL EMERGENCY MANAGEMENT AGENCY REQUIREMENTS FOR DEVELOPMENT OF THE FLOODPLAIN

WHEREAS, in order to receive flood insurance through the Federal Emergency Management Agency (FEMA), the City is required to adopt current FEMA requirements with respect to development within the floodplain; and

WHEREAS, the Community Development Director initiated Plan Text Amendment PTA16-0001; and

WHEREAS, the City provided notice of PTA16-0001 to the Oregon Department of Land Conservation and Development, as provided by ORS 197.610; and

WHEREAS, the City provided notice of the public hearing to all property owners in compliance with ORS 227.186 (Ballot Measure 56); and

WHEREAS, notice of public hearing of PTA16-0001 was given as required by Tualatin Development Code (TDC) 1.031; and

WHEREAS, Council approved PTA16-0001 after a public hearing was held where Council heard and considered the testimony and evidence presented by City staff, and those appearing at the public hearing.

THE CITY OF TUALATIN ORDAINS AS FOLLOWS:

Section 1. TDC 70.050 is amended to read as follows:

The City of Tualatin adopts the maps entitled “Flood Insurance Rate Map, Washington County, Oregon and Incorporated Areas,” effective date November 4, 2016 together with the “Flood Insurance Study for Washington County Oregon and Incorporated Areas,” dated November 4, 2016. The Flood Boundary and Floodway Maps, as provided for in the regulations of the Federal Emergency Management Agency (FEMA) (44 CFR part 59-60) are adopted by reference as establishing the floodplain, floodway, and drainage hazard areas of the City of Tualatin. Where the maps are not available or where the City Engineer determines more accurate information is available, the City Engineer may use any base flood elevation and floodway data available from a federal or state source, or from a licensed professional engineer, to determine the boundaries of the floodplain, floodway, and drainage hazard areas of the City of Tualatin, as provided in TDC 70.140.

~~The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for the City of Tualatin," dated February 19, 1987, with accompanying Flood Insurance Maps is hereby adopted by reference and declared to be a part of this chapter.~~ The Flood Insurance Study is on file at the City Center, 18880 SW Martinazzi Avenue, Tualatin, Oregon 97062.

Section 2. TDC 70.135 is added to the Tualatin Development Code as follows:

TDC 70.135 Provide Base Flood Elevation and Freeboard to Building Official.

The City Engineer will provide the base flood elevation information to the Building Official along with any freeboard requirements in order to administer the Building Codes.

Section 3. TDC 70.180 is amended to read as follows:

Section 70.180 Specific Standards.

In all areas of special flood hazards where base flood elevation data has been provided as set forth in TDC 70.050, "BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD," or TDC 70.140(2), "USE OF OTHER BASE FLOOD DATA," the following provisions are required:

(1) Residential Construction.

(a) New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated at least one foot above the base flood elevation.

(b) New public streets providing vehicle access to residences, including residences within mixed use developments, shall be constructed at or above the base flood elevation. Public street rights-of-way in existence as of January 14, 1993, shall not be subject to this requirement.

(c) Below grade crawl-space construction in the floodplain shall comply with all NFIP specifications and applicable Building Code Requirements.

(d) Fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:

(i) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.

(ii) The bottom of all openings shall be no higher than one foot above grade.

(iii) Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of flood waters.

(2) Nonresidential Construction.

New construction and substantial improvement of any commercial, industrial or other

nonresidential structure shall either have the lowest floor, including basement, elevated at least one foot above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

(a) Be floodproofed so that below the base flood level the structure is watertight, with walls substantially impermeable to the passage of water.

(b) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

(c) Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and review of the structural design, specifications and plans. Such certification shall be provided to the official as set forth in TDC 70.140(3)(b).

(d) Fully enclosed areas below the lowest floor that are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:

(i) A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.

(ii) The bottom of all openings shall be no higher than one foot above grade.

(iii) Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of flood waters.

(e) Applicants flood proofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the flood proofed level (e.g. a building constructed to the base flood level will be rated as one foot below that level).

(3) Manufactured Dwellings. Manufactured dwellings placed or substantially improved within Zones A1-30, AH, and AE shall be on a permanent foundation and shall have the lowest floor, including basement, elevated at least one foot above the base flood elevation and shall be securely anchored to a foundation system in accordance with TDC 70.170(1)(b).

(4) Recreational Vehicles. Recreational vehicles that are permanently placed or substantially improved within Zones A1-30, AH, and AE shall be on a permanent foundation and shall have the lowest floor, including basement, elevated at least one foot above the base flood elevation and shall be securely anchored to a foundation system in accordance with TDC 70.170(1)(b).

Section 4. TDC 70.200 is added to the Tualatin Development Code as follows:

TDC 70.200 Alterations to Floodplain, Drainage, or Watercourses

(1) Applicants proposing to increase the Base Flood Elevation by more than one foot or alter a watercourse must obtain a Conditional Letter of Map Revision (CLOMR) from FEMA before any encroachment, including fill, new constructions, substantial improvement, or other development, in the regulatory floodway is permitted.

(2) Within six months of project completion, an applicant for a Letter of Map Revision (LOMR) must submit a completed application to FEMA and submit evidence to the City that a Letter of Map Revision (LOMR) has been requested that reflects the as-built changes to the Flood Insurance Study (FIS) and/or Flood Insurance Rate Map (FIRM).

(3) The applicant must prepare and submit technical data to support the Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR) application and pay any processing or application fees to FEMA.

Section 5. The Council adopts as its findings the *Analysis and Findings* set forth in Exhibit 1, which is attached and incorporated by reference.

Section 6. Severability. Each section of this ordinance, and any part thereof, is severable. If any part of this ordinance is held invalid by a court of competent jurisdiction, the remainder of this ordinance remains in full force and effect.

Section 7. Emergency Clause. This ordinance is necessary of the immediate protection of the public peace, health, safety and welfare and takes effect on November 6, 2016.

ADOPTED this ____ day of _____, 2016.

CITY OF TUALATIN OREGON

BY_____
Mayor

APPROVED AS TO LEGAL FORM

BY_____
City Attorney

ATTEST

BY_____
City Recorder

PTA16-0001: ANALYSIS AND FINDINGS

FLOODPLAIN ORDINANCE UPDATE 2016

Plan Text Amendment 16-0001 (PTA16-0001) amends the Tualatin Development Code to adopt Federal Emergency Management Agency (FEMA) Requirements for Development in the Floodplain. The purpose of these amendments is to facilitate local implementation of the National Flood Insurance Program requirements and to adopt the best available geographic data defining locations that are at a high risk of flooding.

Amendments are proposed to the following chapter and section:

Chapter 70 Flood Plain District

Background

The National Flood Insurance Program (NFIP) is a federal program created in 1968 through passage of the National Insurance Act and administered by the Federal Emergency Management Agency (FEMA). The program allows owners of property in a 100-year floodplain to obtain federally-backed flood insurance for their property in jurisdictions that have adopted land use ordinances to regulate floodplain development.

The Flood Insurance Rate Map (FIRM) is an official map on which FEMA has delineated both the Special Flood Hazard Area (SFHA) and other flood zones within a community. The SFHA is the area where floodplain management regulations of the NFIP must be enforced and where the mandatory purchase of flood insurance applies. The FIRM also notes the Base Flood Elevations (BFEs) for maps areas. BFEs inform both insurance rates and aid in identifying where flood plain development can occur.

On May 4, 2016 the City received a letter from FEMA which requires the City "to adopt or show" prior to November 4, 2016 "evidence of adoption of floodplain management regulations that meet [certain] standards" (Exhibit 1). This requirement is a condition of continued eligibility in the National Flood Insurance Program (NFIP). The letter provides pertinent background information as follows:

> "On February 19, 1987, the Department of Homeland Security's FEMA issued a FIRM that identified the SFHAs, the areas subject to inundation by the base (1-percent-annual-chance) flood in [our] community. [The City of Tualatin adopted the Study and FIRMs into the Development Code in 1998.] FEMA has recently completed a re-evaluation of flood hazards in [our] community. On September 28, 2007 FEMA provided [the City] with Preliminary copies (and Revised Preliminary copies on December 4, 2009) of the FIRM and Flood Insurance Study report that

identify existing flood hazards in Tualatin, including Base Flood Elevations (BFEs). The proposed BFEs for Tualatin were published in *The Times* on October 25, 2012 and November 1, 2012 and in the *Federal Register*, at part 67, Volume 77, Pages 21516 through 21521, on April 10, 2012.

The statutory 90-day appeal period, which was initiated on the second newspaper publication date cited above, has ended. FEMA did not receive any appeals of the proposed BFEs during that time. Accordingly, the BFEs for Tualatin are considered final. The final rule for BFEs will be published in the *Federal Register* as soon as possible. The FIRM for Tualatin will become effective on November 4, 2016.

It must be emphasized that all the standards specified in Paragraph 60.3(d) of the NFIP regulations must be enacted in a legally enforceable document. This includes adoption of the current effect FIRM and FIS report to which the regulations apply and other modifications made by this map revision. Some of the standards should already have been enacted by your community in order to establish initial eligibility in the NFIP. Your community can meet any additional requirements by taking one of the following actions:

1. Amending existing regulations to incorporate any additional requirements of Paragraph 60.3(d);
2. Adopting all the standards of paragraph 60.3(d) into one new, comprehensive set of regulations; or
3. Showing evidence that regulations have previously been adopted that meet or exceed the minimum requirements of Paragraph 60.(d)

Communities that fail to enact the necessary floodplain management regulations will be suspended from participation in the NFIP and subject to the prohibitions contained in Section 202(a) of the Flood Disaster Protection Act of 1973 (Public Law 93-234) as amended.

In addition to your community using the FIRM and FIS report to manage development in the floodplain, FEMA will use the FIRM and FIS report to establish appropriate flood insurance rates. On the effective date of the revised FIRM, actuarial rates for flood insurance will be charged for all new structures and substantial improvements to existing structures located in the identified SFHAs. These rates may be higher if structures are not built in compliance with the floodplain management standards of the NFIP. The actuarial flood insurance rates increase as the lowest elevations (including basement) of new structures decrease in relation to the BFEs established for your community. This is an important consideration for new construction because building at a higher elevation can greatly reduce the cost of flood insurance."

The City of Tualatin proposes legislative amendments to the Tualatin Development Code (TDC) to amend existing regulations to incorporate any additional requirements of Paragraph

60.3(d) of the National Flood Insurance Program regulations. Amendments are proposed to Chapter 70 Flood Plain District of the Tualatin Development Code.

The Analysis and Findings presented here pertain only to the Plan Text Amendment proposed to amend language in the Tualatin Development Code.

Plan Amendment Criteria (TDC Section 1.032)

The approval criteria of the Tualatin Development Code (TDC), Section 1.032, must be met if the proposed PTA is to be granted. The plan amendment criteria are addressed below.

1. Granting the amendment is in the public interest.

Finding: Floodplain boundaries do not stay constant but rather undergo change over time due to the effects of erosion, development impacts such as increased run off, vegetation removal that can affect flood water retention and release, changes in weather patterns and other factors. To account for flood plain boundary changes, FEMA periodically adjusts the 100-year floodplain maps used by local jurisdictions. The City does not conduct flood plain inventories but relies on FEMA for the determination of the 100-year floodplain boundary. Mortgage lenders will typically notify homeowners whose property is in the flood plain that they are required to carry flood insurance. Homeowners without a mortgage are not required by law to obtain flood insurance but will not be covered for any property damage caused by flooding.

FEMA periodically amends the regulatory requirements of the NFIP through updates to the local FIRM and a corresponding Flood Insurance Study Report. Prior to amending the FIRM and/or developing new or revised flood plain requirements as part of the NFIP updates, FEMA coordinates with local jurisdictions (known as “discovery” process) to determine local flood area conditions, including areas of flood risk and potential mitigation for development.

As stated in the May 4, 2016 letter from FEMA, the City is required to update its floodplain management regulations to meet standards set out in the NFIP as a condition of continued eligibility in the National Flood Insurance Program (NFIP). Communities that fail to enact the necessary floodplain management regulations will be suspended from participation in the NFIP and subject to the prohibitions contained in Section 202(a) of the Flood Disaster Protection Act of 1973 (Public Law 93-234) as amended.

The floodplain affects a large portion of the City of Tualatin (755 acres AND 556 Parcels) with residential and employment uses. If the City does not adopt these amendments prior to November 4, 2016, private property owners are not eligible for flood insurance which could endanger a mortgage if the lender requires flood insurance as a term of the loan. Therefore, it is in the public interest to adopt these amendments at this time.

Granting the amendment is in the public interest.

Criterion "1" is met.

2. The public interest is best protected by granting the amendment at this time.

FINDING: According to the May 4, 2016 letter from FEMA the City of Tualatin is required to adopt floodplain management regulations that meet the standards of Paragraph 60.3(d) by the effective date of the FIRM which is November 4, 2016, as a condition of continued eligibility in the National Flood Insurance Program.

Granting the amendment at this time best protects the public interest.

Criterion "2" is met.

3. The proposed amendment is in conformity with the applicable objectives of the Tualatin Community Plan.

The applicable objectives of the Tualatin Community Plan are discussed below:

Chapter 3 Technical Memoranda
Section 3.030 Natural Resources

(1) Geology
(c) Tualatin River. The Tualatin River originates on the eastern slope of the Coast Range. The watershed averages 40 miles long and 25 miles wide, draining 711 square miles before entering the Willamette River. About ½ of the watershed is in the valley, where the stream is flat with wide flood plains.

(3) Wildlife…
(c) Tualatin River. The Tualatin River and its floodplain from the western boundary of the Study Area to just past its junction with Fanno Creek has been identified as a wetland and marsh area. The River itself is an important fish migration route. The river and its associated vegetation are important natural habitats.

Section 3.040 Natural Hazards

(1) Flooding. The last 3 miles of the Tualatin River, about 5 ½ miles downstream from the City of Tualatin, consists of a narrow gorge with a vertical drop of nearly 40 feet. Natural reefs occurring upstream limit the River's ability to pass flood flows. The reefs create a natural dam, forcing water to back up and flood into the Tualatin Valley.

a. Season. Flooding usually occurs between mid-November and mid-February, due to rainfall and snow melt. Unlike most Oregon streams, the wide, flat flood plains of the Tualatin Valley store large volumes of water that cause the River to peak slowly and remain above flood stage for several days.
b. Area. The core of the City of Tualatin is highly vulnerable to flooding of the Tualatin River. A 100-year frequency flood would cause extensive flooding in the City of Tualatin. It would also flood a large area west and east of the City's downtown and a large area in the northwest portion of the Study Area.
c. Existing flood control. Present flood control projects on the Willamette River do not appreciably affect flood conditions of the City of Tualatin. Upstream flood control measure on the Tualatin River will provide only limited benefits to the Tualatin Valley, as key physical constraints occur at the natural reefs downstream.

Chapter 4 Community Growth
Section 4.050 General Growth Objectives.

(11) Coordinate development plans with regional, state, and federal agencies to assure consistency with statutes, rules, and standards concerning air, noise, water quality, and solid waste. Cooperate with the U.S. Fish and Wildlife Service to minimize adverse impacts to the Tualatin River National Wildlife Refuge from development in adjacent areas of Tualatin.

(12) Adopt measures protecting life and property from natural hazards such as flooding, high groundwater, weak foundation soils and steep slopes.

FINDING: The sections from the Tualatin Comprehensive Plan indicate that flooding from the Tualatin River could cause extensive damage. The 1996 floods in Tualatin did cause damage to private and public structures. Adopting the amendment to the Chapter 70 Flood Plain adopts new Base Flood Elevations which are the regulatory benchmark for development in a flood plain. Local jurisdictions are required to adopt new floodplain regulations or amend existing floodplain regulations to incorporate the updated information into their local documents. Adopting updated FEMA requirements will enable local communities (and private property owners) to participating in the National Flood Insurance Program.

The proposed amendment is in conformity with the applicable objectives of the Tualatin Community Plan.

Criterion "3" is met.

4. The following factors were consciously considered:

The various characteristics of the areas in the City.

FINDING: The amendments are intended to implement, through the City's Development Code Chapter 70 Flood Plain, regulations on development in areas of the city that FEMA has deemed to be at high risk of inundation under the 100-year flood. Approximately 556 tax lots contain some 755 acres in the 100-year floodplain. The Floodplain requirements would be applied to all new structures and substantial improvements in said high-risk areas.

The suitability of the area for particular land uses and improvements.

Not applicable

Trends in land improvement and development.

FINDING: Tualatin Development Code Chapter 70 regulates development in the floodplain. Adjustments to the FIRM map will not alter how development in the flood plain is currently reviewed and processed.

Property Values.

FINDING: Property values could be affected by the owner's ability to obtain flood insurance. Mortgage lenders will typically notify homeowners whose property is in the floodplain that they are required to carry flood insurance. Homeowners without a mortgage are not required by law to obtain flood insurance but will not be covered for any property damage caused by flooding. Property owners can apply for flood insurance if their local jurisdiction participates in the National Flood Insurance Program and in order to continue Tualatin's participation the City must adopt new the Flood Insurance Rate Maps and Flood Insurance Study.

The needs of economic enterprises and the future development of the area.

FINDING: The 100-year floodplain coves some residential land but most of it covers employment land in industrial and commercial Planning Districts. New buildings or substantial improvements in these areas, which could lead to increased economic activity, will be affected by actuarial rates for flood insurance.

Needed right-of-way and access for and to particular sites in the area.

Not applicable.

Natural resources of the City and the protection and conservation of said resources.

Not applicable.

Prospective requirements for the development of natural resources in the City.

Not applicable.

And the public need for healthful, safe, aesthetic surroundings and conditions.

FINDING: The National Flood Insurance Program allows owners of property in a 100-year flood plain to obtain federally-backed flood insurance for their property in jurisdictions that have adopted land use ordinances to regulate flood plain development. This opportunity provides assurance to property owners that if a flood causes damages the property can be restored.

Proof of change in a neighborhood or area.

FINDING: The City does not assert proof of change in a neighborhood or area.

Mistake in the Plan Text or Plan Map.

FINDING: There is no mistake in the Plan Text or Plan Map.

The above factors were consciously considered.

Criterion "4" is met.

5. The criteria in the Tigard-Tualatin School District Facility Plan for school facility capacity have been considered when evaluating applications for a comprehensive plan amendment or for a residential land use regulation amendment.

Because the PTA does not result in a change to plans or development regulations that would impact school facility capacity, Criterion "5" is not applicable.

6. Granting the amendment is consistent with the applicable State of Oregon Planning Goals and applicable Oregon Administrative Rules.

Of the 19 statewide planning goals, staff determined three goals are applicable.

Goal 1, "Citizen Involvement," states, "To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process."

FINDING: This goal will be met by complying with Tualatin Development Code 1.031

Notice Requirements for Plan Amendments. A notice was published in the Tualatin Times 10 City business days prior to the public hearing. Notices were posted in two conspicuous places within the City. And a measure 56 notice was mailed to all property owners within the floodplain.

The Tualatin Planning Commission held a public meeting on September 15, 2016. This public meeting gave citizens and members of the public an opportunity to comment on the proposed text and the Planning Commission considered these comments when making a recommendation to the City Council. A public hearing before the City Council will occur tonight (October 10, 2016), during which the public can give input on the proposed amendment. All work session agendas and minutes are available to the public through the City website.

This Goal is satisfied.

Goal 2, "Land Use Planning", states, "To establish a land use planning process and policy framework as a basis for all decision and actions related to use of land and to assure an adequate factual base for such decisions and actions."

The Department of Land Conservation and Development (DLCD) has acknowledged the City's Comprehensive Plan as being consistent with the statewide planning goals. The Development Code implements the Community Plan and both pieces combine to make the Comprehensive Plan. The Community Plan establishes a process and standards to review changes to the Tualatin Development Code in compliance with the Community Plan and other applicable state requirements. As discussed above under Criteria "3", the applicable Community Plan standards have been applied to the proposed amendment.

This Goal is satisfied

Goal 7, "Areas Subject To Natural Hazards" Implementation Measure #4, reads as follows: Local governments will be deemed to comply with Goal 7 for coastal and riverine flood hazards by adopting and implementing local floodplain regulations that meet the minimum National Flood Insurance Program (NFIP) requirements.

FINDING: The proposed amendments are designed to adopt and implement local floodplain regulations that meet the minimum National Flood Insurance Program (NFIP) requirements. This requirement will be met.

Ballot Measure 56 Notice to property owners of hearing on certain zone change; form of notice; exceptions; reimbursement of cost. (ORS 227.186)

Section (3) Except as provided in subsection (6) of this section, at least 20 days but not more than 40 days before the date of the first hearing on an ordinance that proposes to amend an existing comprehensive plan or any element thereof, or to adopt a new com-

prehensive plan, a city shall cause a written individual notice of a land use change to be mailed to each owner whose property would have to be rezoned in order to comply with the amended or new comprehensive plan if the ordinance becomes effective.

Section (4) At least 20 days but not more than 40 days before the date of the first hearing on an ordinance that proposes to rezone property, a city shall cause a written individual notice of a land use change to be mailed to the owner of each lot or parcel of property that the ordinance proposes to rezone.

(9) For purposes of this section, property is rezoned when the city:
(a) Changes the base zoning classification of the property; or
(b) Adopts or amends an ordinance in a manner that limits or prohibits land ues previously allowed in the affected zone.

FINDING: Measure 56 requires local jurisdictions to notify property owners when a change to a comprehensive plan or zoning ordinance could result in a rezone of property. As stated above, ORS 227.186 (9) defines rezone as a change to the base zoning classification or a change that limits or prohibits previously allowed land uses. The proposed amendments in this application will not change the base zoning classification of any properties. The City of Tualatin does not have a zoning ordinance but instead relies on Planning Districts to implement land use. No Planning Districts are proposed to change as a result of these amendments. Additionally, the proposed amendments do not limit or prohibit currently allowed land uses.

As stated in the May 4, 2016 letter from FEMA " On the effective date of the revised FIRM, actuarial rates for flood insurance will be charged for all new structures and substantial improvements to existing structures located in the identified SFHAs (Special Flood Hazard Areas). These rates may be higher if the structures are not built in compliance with the floodplain management standards for the NFIP."

Based on the findings above, the City finds that the proposed amendments will not change the base zoning or limit or prohibit currently or previously allowed land uses but rather affect the type of building development in the affected area which is the Floodplain. Therefore a Measure 56 notice is not required.

The PTA complies with Goals 1, 2 and 7, and it complies with Measure 56.

Criterion "6" is met.

7. Granting the amendment is consistent with the Metropolitan Service District's Urban Growth Management Functional Plan.

TITLE 3: WATER QUALITY AND FLOOD MANAGEMENT,

3.07.340 Performance Standards

A. Flood Management Performance Standards.

1. The purpose of these standards is to reduce the risk of flooding, prevent or reduce risk to human life and property, and maintain functions and values of floodplains such as allowing for the storage and conveyance of stream flows through existing and natural flood conveyance systems.

2. All development, excavation and fill in the Flood Management Areas shall conform to the following performance standards:

- **a. Development, excavation and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations.**
- **b. All fill placed at or below the design flood elevation in Flood Management Areas shall be balanced with at least an equal amount of soil material removal.**
- **c. Excavation shall not be counted as compensating for fill if such areas will be filled with water in non-storm winter conditions.**
- **d. Minimum finished floor elevations for new habitable structures in the Flood Management Areas shall be at least one foot above the design flood elevation.**
- **e. Temporary fills permitted during construction shall be removed.**
- **f. Uncontained areas of hazardous materials as defined by DEQ in the Flood Management Area shall be prohibited.**

FINDING: The proposed amendments include language to ensure that, in the Tualatin Development Code Chapter 70: Flood Plain, the carrying capacity of the floodplain is maintained, finished floors are one foot above the Base Flood Elevation, and uncontained areas of hazardous materials as defined by DEQ are prohibited. The proposed amendments are consistent with this goal, and this requirement is met.

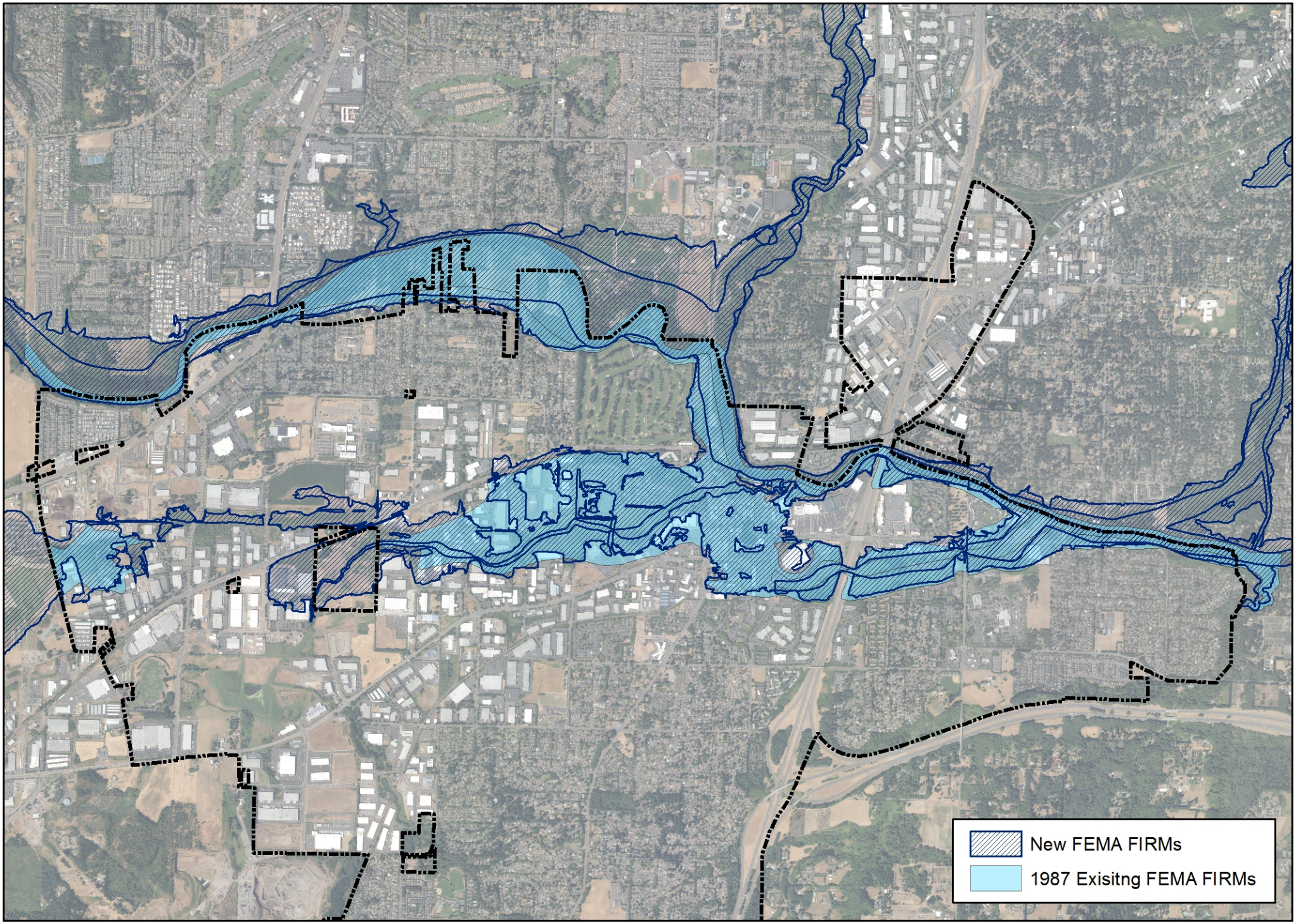
8. Granting the amendment is consistent with Level of Service F for the p.m. peak hour and E for the one-half hour before and after the p.m. peak hour for the Town Center 2040 Design Type (TDC Map 9-4), and E/E for the rest of the 2040 Design Types in the City's planning area.

Because the PTA does not relate to vehicle trip generation, Criterion “8” is not applicable.

Exhibit 1- May 4, 2016 letter from FEMA

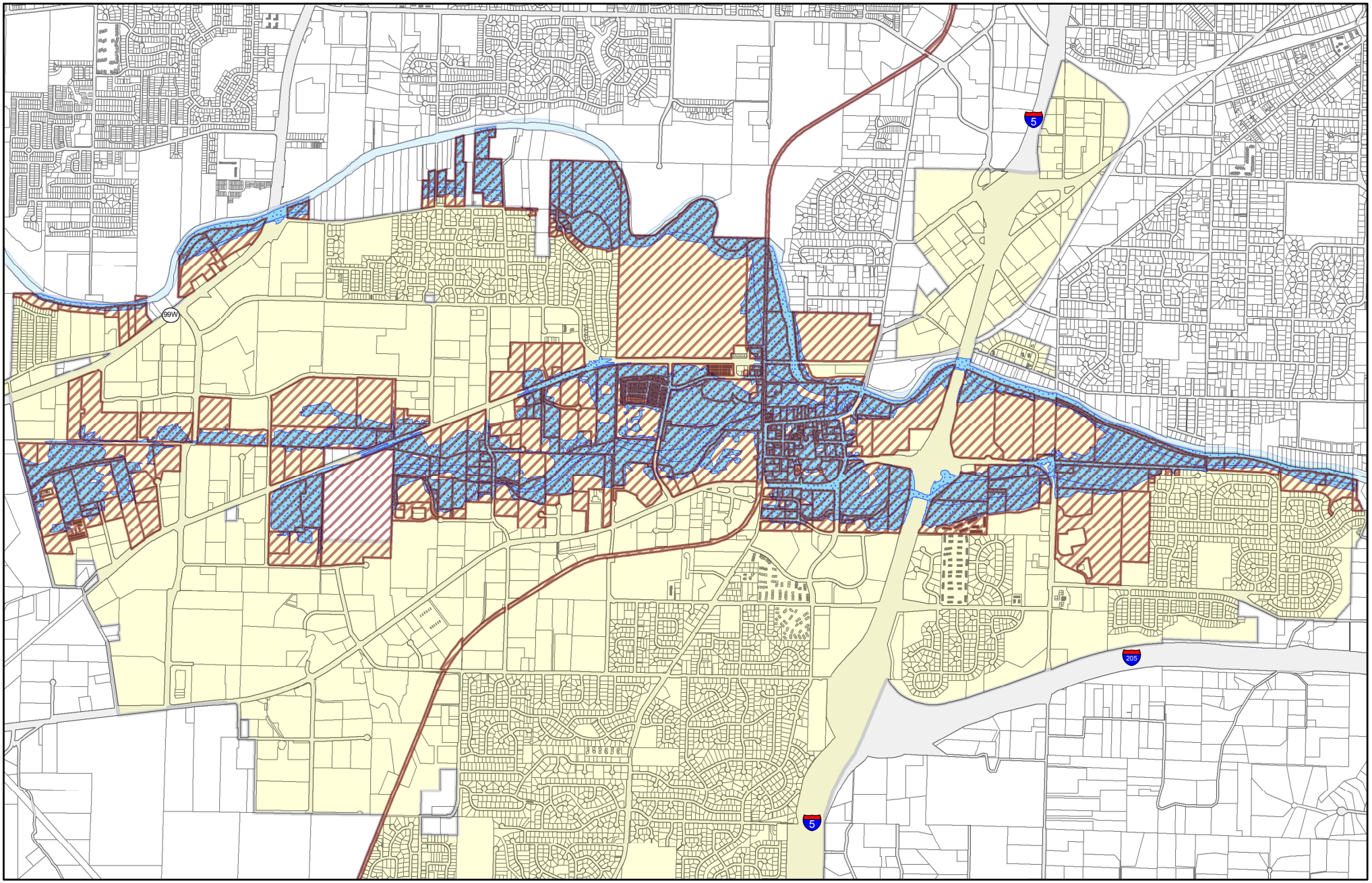
100 Year Floodplain

TUALGIS



100 Year Floodplain within Tualatin

TUALGIS



Taxlots in Floodplain

100 Year Floodplain

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This map is derived from various digital database sources. While an attempt has been made to provide an accurate map, the City of Tualatin, OR assumes no responsibility or liability for any errors or ommissions in the information. This map is provided "as is". -IS Dept.
Printed 8/29/2016

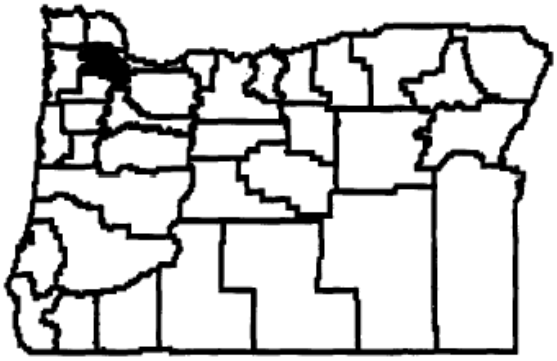
FLOOD INSURANCE STUDY



WASHINGTON COUNTY, OREGON
AND INCORPORATED AREAS

VOLUME 1 OF 3

COMMUNITY NAME	COMMUNITY NUMBER
BANKS, CITY OF	410239
BEAVERTON, CITY OF	410240
CORNELIUS, CITY OF	410261
DURHAM, CITY OF	410263
FOREST GROVE, CITY OF	410241
GASTON, CITY OF	410242
HILLSBORO, CITY OF	410243
KING CITY, CITY OF	410269
NORTH PLAINS, CITY OF	410270
SHERWOOD, CITY OF	410273
TIGARD, CITY OF	410276
TUALATIN, CITY OF	410277
WASHINGTON COUNTY UNINCORPORATED AREAS	410238



Effective: November 4, 2016

Federal Emergency Management Agency

Flood Insurance Study Number
41067CV001A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by a Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS report components.

Users should refer to Section 10.0, Revisions Descriptions. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: November 4, 2016

Revised FIS Report Dates:

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PUBLISHED SEPARATELY

Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Washington County, including the Cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, and Tualatin; and the unincorporated areas of Washington County (referred to collectively herein as Washington County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that the Cities of Rivergrove, Tualatin, and Wilsonville are geographically located in Washington and Clackamas Counties. The City of Tualatin is included in its entirety in this FIS report. The flood-hazard information for the Cities of Rivergrove and Wilsonville are mapped entirely within Clackamas County. See the separately published FIS report and Flood Insurance Rate Map (FIRM) for Clackamas County, OR and Incorporated Areas.

Please note that the Cities of Lake Oswego and Portland are geographically located in Multnomah, Clackamas, and Washington Counties. The flood-hazard information for the City of Lake Oswego is mapped entirely within Clackamas County. The flood-hazard information for the City of Portland is mapped independently. See the separately published FIS reports and FIRMs for Clackamas County, OR and Incorporated Areas, and the City of Portland, OR.

In some States or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (USACE), Portland District, for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement Nos. H-7-76 and H-10-77. This work, which was completed in November 1980, covered all significant flooding sources affecting Washington County.

The Unincorporated study was revised on March 18, 1987, to incorporate existing conditions on overbank areas adjacent to Cedar Mill Creek between Southeast Murray Boulevard and Southwest Jenkins Road (Cross Sections H and J). The width of the floodway for this reach was narrowed by 64 feet at Cross Section H and by 6 feet at Cross Section I. In addition, the corporate limits of the county were revised on the FIRMs and Flood Boundary and Floodway Map (FBFMs) to indicate areas annexed by the City of Beaverton. These annexations placed a reach of Willow Creek just south of Interstate Highway 26 within the City of Beaverton.

The final coordination meeting for the original study for the Tualatin River was held on February 1, 1981, and was attended by representatives of FEMA, the Study Contractor, and the Washington County Departments of Public Works and Planning. No requests for changes were made at that time. A coordination meeting, attended by representatives of the USACE, Portland District, and FEMA, was held on July 20, 1984. This meeting resulted in the reanalysis of the Tualatin River and Nyberg Slough.

In 2005 a restudy was done to incorporate new floodplain data for Ash Creek, Fanno Creek, and Summer Creek, and to incorporate the channel improvement project within the reach of the Tualatin River. The hydrologic and hydraulic analyses for the Ash Creek, Fanno Creek, and Summer Creek restudy were performed by Pacific Water Resources Inc., for Clean Water Services (formerly Unified Sewerage Agency) of Washington County and submitted to FEMA under the Cooperating Technical Partners program. This restudy was completed on June 30, 2000. This revision was requested by Washington County because of the effects of the largest flood since 1980, which occurred along Fanno Creek in February 1996. The February 1996 flood had an estimated recurrence interval of approximately 25 years.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, the state, and the study contractor to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study. All problems raised at these meetings have been addressed in this study.

The dates of the initial and final CCO meetings held for Washington County and the incorporated communities within its boundaries are shown in Table 1, "Initial and Final CCO Meetings."

Table 1. Initial and Final CCO Meetings

Community	Initial CCO Date	Final CCO Date
Beaverton, City of	September 10, 1976	October 29, 1982
Cornelius, City of	September 8, 1976	January 29, 1981
Durham, City of	September 10, 1976	April 18, 1980
Forest Grove, City of	September 9, 1976	April 10, 1981
Gaston, City of	September 9, 1976	July 21, 1981
Hillsboro, City of	September 8, 1976	September 12, 1980
King City, City of	September 9, 1976	February 1, 1981
North Plains, City of	October 22, 1976	April 10, 1981
Portland, City of	September 25, 1974	April 30, 1980
Rivergrove, City of	June 1977	August 21, 1986
Sherwood, City of	September 10, 1976	January 29, 1981
Tigard, City of	September 9, 1976	April 9, 1981
Tualatin, City of	September 9, 1976	February 1, 1981

The results of this revised study were reviewed at two final CCO meetings. The first CCO meeting was held on November 6, 2007, and attended by representatives of Washington County and the cities of Banks, Cornelius, Forest Grove, Hillsboro, North Plains, and by FEMA's Region X representatives. The second meeting was held on November 7, 2007 and attended by representatives of Washington County and the cities of Beaverton, Durham, Sherwood, and Tualatin, and by FEMA's Region X representatives. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Washington County, Oregon, including the incorporated communities listed in Section 1.1. The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon, by FEMA and the communities.

This initial countywide FIS (November 4, 2016) incorporated the determination letters issued by FEMA resulting in map changes (Letters of Map Change, or LOMCs). All Letters of Map Revision (LOMRs) incorporated into this FIS are summarized in Table 2. The Letter of Map Change (LOMC) actions for previously-issued LOMCs for Washington County are summarized in the Summary of Map Amendment (SOMA) included in the Technical Support Data Notebook (TSDN) associated with this FIS update. Copies of the TSDN may be obtained from the Community Map Repository.

Table 2. Incorporated LOMRs

Community	LOMC Case No.	Flooding Source(s)	Date Issued	LOMC Type
Beaverton, City of	06-10-B213P	Fanno Creek	11/6/2006	LOMR
Tigard, City of	07-10-0375A	Redrock Creek	4/10/2007	LOMR-F
Hillsboro, City of	14-10-1241P	Waible Creek – South Tributary	8/15/2014	LOMR
Hillsboro, City of Washington County, Unincorporated Areas	14-10-1501P	Waible Creek, Waible Creek Tributary 1, Waible Creek Tributary 2	12/29/2014	LOMR

2.2 Community Description

Washington County is located in northwestern Oregon. It is bordered on the north by Columbia County, on the south by Yamhill and Clackamas Counties, on the west by Tillamook County, and on the east by Multnomah and Clackamas Counties. Because of its location adjacent to the City of Portland, Washington County experienced rapid growth during the mid-20th century; the population increased from 39,194 in 1940 to

215,000 in 1978 (Reference 1). Most of that increase occurred in the southeastern part of the county. The estimated population in 2010 was 529,710 (Reference 2).

All of the streams considered in this study are part of the Tualatin River drainage basin. The Tualatin River originates in the Coast Range at an elevation of 3,400 feet. The basin has an area of 711 square miles (sq. mi.) and is oval; it is approximately 40 miles long and 25 miles wide. The Tualatin River basin is located in central Washington County. The major portion of the Tualatin River floodplain is widest in the stream length located 7 miles upstream of the mouth to 70 miles upstream of the mouth.

The climate in Washington County is characterized by cool, wet winters and warm, dry summers. Maritime influences mostly dominate the area throughout the year. The average temperature in January is 38°F, and in July the average temperature rises to 66.5°F.

The average annual precipitation for the county is 38.0 inches, which primarily occurs during the months of October through March. Snowfall occurs only a few days each year. Snow on the ground does not last long, and depths seldom exceed 6 inches (Reference 1).

The Tualatin River valley is a broad synclinal valley, and the area of the valley floor represents a large percentage of the total watershed. The upland areas are underlain with basaltic lavas and volcanics, shale, sandstone, and conglomerates, all of which are deeply weathered and covered with loam and clay loam soils capable of supporting dense growths of vegetation. Exceptionally heavy and extended periods of rainfall cause excessive runoff and severe erosion, especially in cleared and burned areas. Two soil groups, the older valley filling and the recent alluvial soil, are represented on the valley floor where drainage, both on the surface and internal, varies from good to poor. Poor drainage at the lower end of the valley can be attributed, in part, to the existence of reefs or ledges of basaltic rock, which have established a temporary base level for the valley (Reference 3).

The uplands of the basin are generally covered with heavy fir timber that has a thick undergrowth and a mat of ferns. Extensive timber cutting has taken place in this part of the basin; however, after a few years, the previous undergrowth reestablishes itself and is supplemented by ferns and wild blackberry vines. Further down the slopes, the timber thins out on the valley floor until it is limited to small, scattered areas. Within the floodplain, scattered scrub oak trees with bands of willow, alder, and brush, as many as several hundred yards in width, parallel both banks of all major watercourses (Reference 3).

City of Beaverton

The City of Beaverton is on the eastern edge of Washington County. It is approximately 11 miles southwest of Portland, Oregon. The city, which was incorporated in 1893, grew to an estimated population of 89,803 in 2010 (Reference 2). Beaverton is bordered by the City of Tigard on the south and by the unincorporated areas of Washington County on all other sides.

Beaverton is a fast-growing community, with a diversified economic base centered around numerous offices and several light industries, including electronics and food processing. In addition, its proximity to Portland gives it many characteristics of a bedroom community. Commercial development is centered in the northern portion of Beaverton, specifically along Cedar Hills Boulevard, Tualatin-Valley Highway, Canyon Road, and Beaverton-Hillsdale Highway. .

City of Cornelius

The City of Cornelius is located in central Washington County. It is situated approximately 15 miles west of Portland. Cornelius was incorporated in 1893 and has grown from a population of 3,450 in 1978 to an estimated 11,869 in 2010 (References 4 and 2, respectively).

Very little development has taken place within the flood plains of Cornelius. The majority of development is south of Council Creek in east-central Cornelius. Commercial and industrial properties are primarily along major transportation routes. These routes include Tualatin Valley Highway, Burlington Northern Railroad, and Southern Pacific Railroad.

City of Durham

The City of Durham is located in the southeastern corner of Washington County. It is approximately 5 miles southwest of the City of Portland, Oregon. The city had an estimated population of 1,351 in 2010 (Reference 2).

The Tualatin River originates in the Coast Range at an elevation of 3,400 feet. The watershed has an area of 711 sq. mi., is oval in shape, and is approximately 40 miles long and 25 miles wide. The topography abruptly changes to a very flat valley and a wide floodplain in the area where Tualatin River emerges from the foothills. The river flows southeasterly through Durham, forming a portion of the southern corporate limits of the city.

Economic activity for this small community is diversified and characterized by non-retail commercial and light industrial uses. For

example, the headquarters for a building contractor and a distribution/trucking depot are located in Durham. In addition, several businesses and office park developments have been constructed on the east side of the Southwest Upper Boones Ferry Road, which serves as the principal transportation corridor through the city. Residential development is characterized by low density single family housing located primarily west of the Southwest Upper Boones Ferry Road. A high density 210 unit apartment development is located in southeast Durham. Floodplains are virtually undeveloped and are planned to remain as permanent open space for park and recreation purposes.

City of Forest Grove

Forest Grove is in central Washington County. It is approximately 21 miles west of Portland, Oregon. The city was incorporated in 1872 and has grown to a population of 21,083 in 2010 (Reference 2).

Forest Grove has a stable economic base, revolving around food processing and wood-products industries. Commercial development is primarily along Tualatin Valley Highway. Due to its proximity to Portland, Forest Grove has also developed into a suburban community. The flood plains are relatively undeveloped. Considerable open space for future development exists outside of the flood plains of Tualatin River, Gales Creek, and Council Creek.

City of Gaston

Gaston is located on the southern border of Washington County. It is approximately 29 miles west of Portland, Oregon. The City of Gaston was incorporated in 1914. The population in 2010 was estimated to be 637 (Reference 2). It is bordered by unincorporated Washington County land to the north, east, and west, and by unincorporated Yamhill County land to the south.

Economic activity in Gaston is centered around forestry and agricultural industries, with food processing playing an especially key role. Commercial development is located primarily along the Tualatin Valley Highway/South Pacific Railroad corridor through the town. Residential development is generally limited to the western portion of Gaston. Only the eastern edge of Gaston is considered flood prone. Several residences in that portion of the community are in the Tualatin River flood plain.

City of Hillsboro

Hillsboro is in central Washington County. The city is approximately 17 miles west of Portland, Oregon. Hillsboro was incorporated in 1876 and had a population of 91,611 in 2010 (Reference 2).

Hillsboro has a rapidly expanding and diversified economy centered around numerous light manufacturing plants. In particular, the electronics industry is becoming more important in the economy of Hillsboro. Due to its proximity to Portland, Hillsboro also has characteristics of a bedroom, or suburban, community. Commercial development in Hillsboro is extensive, with a well-developed business district in the west-central portion of the city and heavy commercial development along Tualatin Valley Highway. Residential areas are scattered throughout the city but are concentrated in the northern and eastern portions of Hillsboro. Important transportation routes in the city include Tualatin Valley Highway (State Highway 8), Sunset Highway (U.S. 26), Cornell Road, State Highway 219, Burlington Northern Railroad, and Southern Pacific Railroad. The flood plains are relatively undeveloped.

City of King City

The City of King City is located in the North Willamette Valley in Washington County. The nearest major highway is Interstate 5 and the nearest major city is Tigard. King City was incorporated in 1966 and had a population of 3,111 in 2010 (Reference 2).

City of North Plains

North Plains is located in north-central Washington County. It is approximately 20 miles west of Portland, Oregon. The city was incorporated in 1963 and had a population of 1,947 in 2010 (Reference 2).

The economy of North Plains is based primarily on agriculture and forestry. Soil types in the city consist of the Woodburn, Aloha, and Willamette Associations. Vegetation consists of grass, Douglas fir, oak, ash, willow, cedar, hazelbrush, maple, and rosebushes. The floodplains in the community are generally undeveloped.

City of Sherwood

Sherwood is located in the southeast corner of Washington County. It is approximately 13 miles southwest of Portland, Oregon. The population in 2010 was 18,194 (Reference 2).

Economic activity in Sherwood is diversified and growing. Industrial facilities in the community include a wood products plant, a leather tannery, and a machine manufacturing plant. In addition, agriculture and support services augment the income of the community. Commercial development is primarily in the central section of Sherwood. Residential development is spread throughout the city. Important transportation routes are Pacific Highway West (State Highway 99), Edy Road, Sherwood

Road, and the Southern Pacific Railroad. There is no development in the flood plain.

City of Tigard

Tigard is in the southeast corner of Washington County. It is approximately 8 miles southwest of Portland, Oregon, and is adjacent to the City of Beaverton to the north and to the City of Durham to the south. Unincorporated areas of Washington County also border Tigard, along with some small county areas that are within the city. Tigard was incorporated in 1961; the estimated population in 2010 was 48,035 (Reference 2).

Economic activity in Tigard is diversified and growing. Industrial facilities in the community are varied and are located along Pacific Highway West (State Highway 99W) and State Highway 217 (US217). Commercial development is located primarily along Pacific Highway West and Southwest Main Street. Residential development in Tigard is mostly west of Fanno Creek. Important transportation routes in the city are Pacific Highway West, US217, Hall Boulevard, and the Burlington Northern and Southern Pacific Railroads. The floodplains of several areas along the studied stream reaches are undergoing development. One such area is along Summer Creek between Southwest 113th and Southwest 121st Avenues, where several residences are in the floodplain. Another flood-prone area includes commercial and residential development along a 1-mile reach of Fanno Creek from Pacific Highway West upstream to Southwest Tiedeman Avenue.

City of Tualatin

Tualatin is in the southeastern corner of Washington County and the northwestern portion of Clackamas County. It is bordered by the City of Durham, to the north, by the City of Lake Oswego to the east, and by unincorporated areas of Washington and Clackamas Counties to the west and south. Tualatin is approximately 5 miles southwest of the City of Portland. The population was estimated to be 26,054 in 2010 (Reference 2).

The broad-based economy of Tualatin is subject to strong growth. Most of the economic activity centers in the central business district, where commercial development is interspersed with local industries. In the central business district, development includes new large retail chain stores. Industrial development in this area includes a food-processing plant and several warehouses. Residential development is concentrated in the northwestern and southwestern portions of Tualatin. New development is occurring throughout the southern portion of Tualatin on the benchlands above the Nyberg Slough flood plain.

2.3 Principal Flood Problems

The past history of flooding of the streams within Washington County indicates that, for a particular storm, flooding usually occurs on many streams throughout the study area. Flooding is caused by heavy rainfall augmented by snowmelt at a time when the soil is near saturation. Damaging floods may occur any time between late October and late April. The most severe floods occur in December, January, and February.

The largest flood recorded on the Tualatin River at West Linn since the U.S. Geological Survey (USGS) established a stream gage there in 1928 occurred in December 1933. The peak discharge at the gage was 23,300 cubic feet per second (cfs) with a 1.4-percent-annual-chance of flooding. The January 1974 flood on the Tualatin River also caused considerable damage to the study area. That flood had an estimated discharge of 22,300 cfs with a 4-percent-annual-chance of flooding. The flood occurred before the operation of the Henry Hagg Lake Project (Reference 6). The operation of the Henry Hagg Lake Project has decreased the frequency of a flood of 21,500 cfs to a 2-percent-annual-chance of flooding for the Tualatin River at West Linn.

Other major Tualatin River flood occurred in December 1937, December 1955, December 1964, January 1974, and February 1996. Before 1928, flooding was not well documented, but major floods occurred in February 1890, November 1896, February 1904, January 1905, and January 1914.

The February 1996 flood on the Tualatin River was the largest flood flow ever recorded with an estimated 84-year return interval and an annual probability of recurrence of 1.2%. However, for almost all of the smaller urbanized Tualatin River tributaries that were studied, the November 1996 flood is thought to be the largest flood ever observed with an estimated 25-year return interval and an annual probability of recurrence of 4%.

Records of past flood on the remaining study reaches in Washington County are not well documented. Flood damages have been small in these unincorporated areas because their floodplains are sparsely developed.

However, the floodplain of Nyberg Slough is not sparsely developed. In the 1974 flood, a business district sustained heavy damage when the Tualatin River overtopped its banks and entered Nyberg Slough, an overflow channel. A Tualatin River flood with a recurrence interval greater than 15 years would be expected to flow through Nyberg Slough.

City of Beaverton

No gaging stations are located along Beaverton Creek, Fanno Creek, South Johnson Creek, Erickson Creek, or Cedar Mill Creek. However, history indicates that Beaverton has had recurrent and substantial flood problems from these streams. The largest flood along the creeks in the study area since 1970 occurred in December 1977. The 1977 flood had an estimated recurrence interval of approximately 10 years. Flood damage in Beaverton was moderate; most occurred near the intersections of SH 217 with SH 8 and SH 10.

The potential for property damage from Beaverton Creek overflows is especially severe for several reasons. The inadequate size and moderate grade of the channel through the study segment causes overbank flooding during even mild storms. Beaverton Creek flow is constricted by many culverts and bridges, resulting in increased upstream flood heights. Finally, the potential for property damage is significant because of the extensive commercial and residential development within the Beaverton Creek floodplain.

Fanno Creek, South Johnson Creek, Erickson Creek, and Cedar Mill Creek also have flooding problems. However, the flood damage potential from these streams is not as large as that from Beaverton Creek. Generally, the floodplains along these streams have not been extensively developed. The only area with a major flooding problem is a residential development in the Fanno Creek floodplain just upstream of SH 217.

City of Cornelius

Since October 1939, the USGS has maintained a stream gage on Tualatin River near Dilley, Oregon. The largest flood at that gage occurred in December 1964, when a flow of 17,100 cfs was observed. The average return interval for the 1964 flood was 190 years. Major floods were also recorded at Dilley in December 1955, January 1964, January 1972, and January 1974. All peak discharges after 1974 were affected by regulation or diversion, and are thus not considered major floods. Prior to 1939, flooding was not well documented in the upper Tualatin River basin. However, records from a gage on Tualatin River near West Linn, Oregon, indicate major floods occurred in December 1933 and December 1937.

Generally, Cornelius is free of flood damage by riverine sources because there is almost no development in the flood plain.

City of Durham

Five major floods have occurred on the Tualatin River at Durham since the USGS established a stream gage at West Linn in 1928. Those floods

occurred in December 1933, December 1937, December 1955, December 1964, and January 1974, and had return intervals of approximately 90, 45, 20, 10, and 25 years, respectively. These floods had peak discharges of 28,300; 25,300; 21,400; 17,700; and 22,000 cfs, respectively, at the West Linn gage. All peak discharges after 1974 were affected by regulation or diversion, and are thus not considered major floods. Considerable development in Durham took place on high ground, resulting in only minor flood damage to property.

Fanno Creek has flooded low areas downstream of Durham Road. However, damage has been slight because of minimal development in the floodplain. Fanno Creek has no major obstructions that aggravate flooding problems in Durham.

City of Forest Grove

The USGS has maintained two stream gages on Gales Creek periodically since 1935; one near the Town of Gales Creek, period of record 1936 to 1945 and 1964 to 1970, and the other near Forest Grove, period of record 1941 to 1956 and 1971 to 1980. The largest recorded flood at either station occurred in February 1949 when a discharge of 6410 cfs, a 5.9-percent-annual-chance flood, was recorded near Forest Grove. Other major floods have been recorded in December 1955, January 1964, December 1964, January 1972, and December 1977. There are no stream gages on Council Creek.

Due to the undeveloped or lightly developed state of the flood plains within Forest Grove, damages caused by flooding have been minimal. Water-related damage in the city generally results from high ground water and local drainage problems.

City of Gaston

The largest recorded flood on Tualatin River in the vicinity of the City of Gaston occurred in December 1964. The peak discharge at the USGS stream gage near Dilley, 4 miles downstream of City of Gaston, was 17,100 cfs. The 1964 flood was a 0.5-percent-annual-chance flood. That flood caused minor damage to residences located east of Tualatin Valley Highway in Gaston. There have been numerous other large floods on Tualatin River, including those which occurred in 1933, 1937, 1955, 1972, and 1974.

The largest flood on Wapato Creek occurred in 1949. Although stream gage records are not available, it is estimated that the 1949 flood was a 2-percent-annual-chance flood. Flood damages in Gaston were light because development in the flood plain had been avoided.

City of Hillsboro

The City of Hillsboro is generally free of flood damage from riverine sources. Most damage in the city results from higher ground water and ineffective local drainage.

City of King City

Intense rainfall runoff from massive winter storms moving inland from the Pacific Ocean has combined with snowmelt runoff to produce large Tualatin River floods. The largest flood recorded at the City of West Linn since the USGS established a stream gage there in 1928 occurred in December 1933. The peak discharge at the gage was 23,300 cfs, with an approximate recurrence interval of a 1-percent-annual-chance flood.

The city of King City is affected by the Tualatin River but damage is small because of the limited development in the flood plain. Past damages in the city resulted from high ground water and ineffective local drainage.

City of North Plains

Flooding in North Plains is caused by intense rainfall from massive winter storms moving inland from the Pacific Ocean. This often results in simultaneous flooding on all streams in the study area, as in the flood of December 1964. Flooding on the unnamed tributary downstream of Glencoe Road at River Mile (RM) 0.27 is greatly accentuated by coincident flooding on McKay Creek. Flooding upstream of Glencoe Road is also influenced by the backwater effect of McKay Creek. The 1.8-mile study reach has several highly constrictive culverts that cause substantial ponding. This includes the culvert crossing at Glencoe Road (RM 0.27) and the Burlington Northern Railroad (BNRR) culvert crossing at RM 1.20. At the BNRR culvert crossing, backwater from the 10-percent-annaul-chance flood and greater floodflows would overflow the right bank at Gordon Road.

There are no stream gage stations on either McKay Creek or Unnamed Tributary of McKay Creek, but local officials and residents have substantial knowledge of flooding conditions through the study reach. Local officials indicate that floods rise quickly following a rainstorm and may last a full day. Coincident flooding on McKay Creek is primarily responsible for this relatively long flood duration for a small stream of 2.5 square miles drainage area. The constrictive culverts at RM 0.27 and RM 1.20 also contribute to the extended duration.

The most recent flood on January 31, 1987, closely followed this pattern of flood duration and coincident flooding on McKay Creek. Based on numerous high water marks, flood photographs, and interviews with local

officials and residents, the January 31, 1987, flood was estimated to be greater than a 10-year recurrence interval. Flood damages were minor, however, consisting of numerous closed roads and isolation for several property owners. Flooding has occurred on a fairly regular basis on the Unnamed Tributary, and that knowledge has discouraged development in the floodplain.

City of Sherwood

Flooding from Cedar Creek and Rock Creek South is generally caused by rainfall in the winter, the period of greatest storm activity. Flood rise quickly following a heavy rainstorm and usually last less than 1 day.

The largest flood on both streams in the last 30 years occurred in December 1977. Heavy rains at that time caused some shallow flooding along the Rock Creek South flood plain. Sherwood Road, the main arterial to the City of Tualatin, was under approximately 1 foot of floodwater from Rock Creek South. No structures located along Rock Creek South were reported flooded. Flood damage from Cedar Creek was negligible because that stream is in a ravine.

City of Tigard

Flooding on the Tualatin River, Fanno Creek, Ash Creek, and Summer Creek is primarily caused by rainstorms in the winter, the period of greatest storm activity. Floods rise quickly following a heavy rainstorm and usually last less than 1 day on Fanno Creek and half a day on Ash and Summer Creeks.

Flooding in Tigard is not well documented. During the last 30 years, the largest flood on Fanno, Ash, and Summer Creeks occurred in December 1977. Although stream gage records are not available, it is estimated that the 1977 flood recurrence interval was approximately a 10-percent-annual-chance flood for the three streams. Flood damages in Tigard were minor because the areas susceptible to flooding were known and development was avoided in those areas. Flooding along Summer Creek is accentuated by a high ground water table, which causes nuisance flooding that affects numerous residences.

City of Tualatin

Intense rainfall runoff from massive winter storms moving inland from the Pacific Ocean has combined with snowmelt runoff to produce large Tualatin River floods. The largest flood recorded at the City of West Linn since the USGS established a stream gage there in 1928 occurred in December 1933. The peak discharge at the gage was 23,300 cfs, with an approximate recurrence interval of a 1-percent-annual-chance flood. The

central business district of Tualatin sustained heavy damage when the Tualatin River overtopped its banks and entered Nyberg Slough. A Tualatin River flood with greater than a 6.6-percent-annual-chance flood would be expected to flow through Nyberg Slough and inundate much of the central business district.

The January 1974 flood on the Tualatin River caused considerable damage to the study area. That flood had an estimated discharge at Tualatin of 22,340 cfs, which was estimated to be a 2.5-percent-annual-chance flood. The central business district, located on Nyberg Slough, was hit especially hard. Peak Nyberg Slough flow was approximately 2,600 cfs.

Flooding on Hedges Creek is often elevated by Tualatin River backwater flooding. Urbanization of the Hedges Creek drainage basin could increase future flood problems.

2.4 Flood Protection Measures

The Tualatin River basin has one multipurpose flood-control storage project. The Henry Hagg Lake Project, located northwest of the City of Gaston, was constructed by the U.S. Bureau of Reclamation (USBR). That project began operation in the 1974-75 flood season. It provides 30,000 acre-feet of flood storage starting in November of each year. Flood storage capacity is reduced as the winter flood season terminates, and the reservoir is filled each spring in anticipation of the summer irrigation demand. This storage would reduce the discharge of a flood, such as the flood of 1964, by approximately 3,000 cfs. The effect of Henry Hagg Lake Project flood storage has been considered in the calculation of water-surface profiles for the Tualatin River reach in the following communities: Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, Tigard, and Tualatin.

The USBR has completed a draft feasibility study of two alternative storage project on the Tualatin River near Gaston, which could provide additional flood storage in the Tualatin River Basin. Those projects, however, are still in the planning stages and are not reflected in the data presented (Reference 6).

Nonstructural measures are also being used to aid in the prevention of future flood damage. These measures are based on a flood hazard zoning ordinance for controlling development within the 1-percent-annual-chance floodplain. This ordinance requires the county or the city to review all proposed development within the 1-percent-annual-chance floodplain to ensure that it is reasonably safe from flooding. The FEMA guidelines for controlling development within the flood plain are followed (Reference 7).

City of Beaverton

No structural flood protection measures are being used to help prevent future flood damage in Beaverton, but several culverts have been enlarged on Beaverton Creek to improve the flooding situation. The Southern Pacific Railroad culvert was improved, as were numerous culverts in the Canyon Road area.

City of Gaston

There is a levee along the right bank of Wapato Creek which was considered in the analysis of flood elevations. However, the levee does not provide 1-percent-annual-chance flood protection.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50- 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community. Some of the flooding sources in the discussion below are superseded with new studies. Pease refer to section 10 for details of updates.

Tualatin River stream-gage records were analyzed statistically, using the log-Pearson Type III distribution, as outlined by the U.S. Water Resources Council (Reference 8). Discharge-frequency curves for USGS stream gages at West Linn, Dilley, and Farmington were developed utilizing records from 1938 to 1976, 1940 to 1975, and 1939 to 1958, respectively.

As a result of the relatively short record, Farmington gage data were adjusted using the long-term station data at West Linn. All downstream discharges were adjusted for flood control furnished by the Henry Hagg Lake Project.

Peak Tualatin River discharges near the downstream corporate limits of Tualatin were reduced to reflect flows into Oswego Canal by way of a diversion dam and outlet works. The Oregon Iron and Steel Dam at RM 3.4 and its outlet work at RM 6.7 divert flow from the Tualatin River into Oswego Canal to stabilize the Lake Oswego water level. A stream gage on

Oswego Canal has been maintained by the USGS since 1928 to measure this outflow from the Tualatin River.

The USGS has maintained two stream gages on Gales Creek periodically since 1935; one near the Town of Gales Creek, with periods of record from 1936 to 1945 and from 1964 to 1970, and the other near the City of Forest Grove, with periods or record from 1941 to 1956 and from 1971 to the present. The U.S. Water Resources Council guidelines (Reference 8) for broken record stations were applied to these sets of data, and discharge-frequency curves were prepared for both stations.

Peak discharge-drainage are relationships for selected recurrence intervals on Dairy Creek, West Fork Dairy Creek, McKay Creek, and Unnamed Tributary of McKay Creek were obtained from a Myer's rating curve developed from several nearby stream gages. These gages included three on the Tualatin River, one on Gales Creek, and one on Johnson Creek in Multnomah County, respectively.

The frequency discharges for the Unnamed Tributary of McKay Creek were developed by the regional analysis presented in "Magnitude and Frequency of Floods in Western Oregon," U.S. Geological Survey Open-File Report 79-553, dated 1979 (Reference 9). The frequency discharges developed by this procedure were checked for reasonableness of results.

The U.S. Natural Resources Conservation Service, formerly the Soil Conservation Service (SCS), method for rainfall-runoff and unit hydrograph determination (Reference 10) was used in conjunction with USACE computer programs (Reference 11, 12, and 13) for hydrograph computing, combining, and routing, for the purpose of generating flood hydrographs for selected recurrence intervals on the remaining detailed study streams in Washington County.

Peak flows from the July 1981 FIS report for the City of Durham (Reference 15) were used for the Fanno Creek restudy. The discharges used for the Tualatin River are taken from the channel improvement restudy of the Tualatin River, completed in 1983 by the USACE, as shown in the February 1987 FIS report for the City of Tualatin.

Peak discharge-drainage area relationships for Washington County are shown in Table 3, Summary of Discharges.

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Ash Creek					
At mouth	4.0	750	950	1,000	1,250
At Hall Boulevard	2.5	450	600	650	800
Beaverton Creek					
Upstream of Bronson Creek Confluence	31.4	3,943	5,063	5,518	6,605
At Cedar Hills Boulevard	6.5	1,039	1,353	1,480	1,771
Bronson Creek					
At mouth	5.0	518	656	714	855
At Northwest Kaiser Road	3.2	351	443	482	577
Butternut Creek					
At mouth	5.0	682	865	941	1,116
At Southwest 198th Avenue	2.9	498	628	680	801
At Southwest 185th Avenue	1.8	302	380	412	484
Cedar Creek					
At mouth	8.9	744	863	909	1,028
At State Highway 99 W	8.3	753	851	897	1,016
At Sunset Blvd	6.6	844	1,208	1,359	1,732
Cedar Mill Creek					
At mouth	8.4	1,050	1,289	1,384	1,588
At Northwest Barnes	3.0	467	585	632	699
Cedar Mill Creek - North overflow	3.4	65	181	230	306
Cedar Mill Creek - South Overflow					
At mouth	3.5	9	84	120	180
Cedar Mill Creek - Upper North Overflow	3.4	57	141	164	198
Celebrity Creek					
At mouth	0.8	150	188	203	238
US of Rosa park pedestrian bridge	0.7	127	158	171	200

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Chicken Creek					
At mouth	15.6	1125	1429	1580	1959
US of Cedar Creek confluence	8.9	744	863	909	1028
At Wilsonville road	6.5	939	1,321	1,502	1889
Chicken Creek - West Tributary					
At mouth	1.6	309	425	477	611
Council Creek					
At Hobbs Road	10.8	1,089	1,819	1,952	2,264
At Cornelius Schefflin Road	7.2	875	1,408	1,502	1,722
At Martin Road	5.0	609	1,005	1,077	1,245
At Beal Road	206.0	240	407	438	514
Dairy Creek					
Downstream of McKay Creek Confluence	296.4	19,513	30,176	32,847	37,816
Downstream of McKay Creek Confluence	230.2	15,104	23,793	25,396	29,247
Dawson Creek					
At mouth	4.3	601	755	819	976
At N.W. Brookwood Avenue	3.7	517	652	706	836
Erickson Creek					
At mouth	1.7	278	352	382	451
Farmington road	1.5	99	162	188	249
SW 9th Ave	0.7	115	146	158	186
Fanno Creek					
At mouth	32.0	2,950	3,850	4,250	5,150
At Southwest Tiedeman Avenue	24.0	2,750	3,500	3,850	4,700
At Southwest Dakota Street	17.0	1,900	2,450	2,700	3,250
At State Highway 217	10.0	1,400	1,800	1,970	2,400
At Washington-Clackamas County boundary	5.0	950	1,150	1,300	1,550

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Gales Creek					
At Stringtown Road	69.0	6,000	8,400	9,450	12,000
At Roderick Road Gage	66.0	5,800	8,150	9,150	11,600
Glencoe Swale					
At mouth	3.78	266	337	349	368
Shannon road	2.6	346	599	645	753
Jackson school road	2.3	321	552	594	692
15th Avenue	1.9	247	432	464	543
Sewell Avenue	0.8	98	171	185	217
Golf Creek					
At mouth	1.4	317	389	419	488
Gordon Creek					
At mouth	1.5	157	191	205	236
Hall Creek					
At mouth	4	720	923	1001	1179
Hwy 217 & 114th Ave	2.9	540	686	741	872
Kennedy St	2.4	490	611	660	774
Near 99th Ave	1	182	229	249	294
Hall Creek - 106th Tributary					
At mouth	0.2	50	63	68	80
Hall Creek - North Fork					
At mouth	1.0	189	239	259	306
Hall Creek - South Fork					
At mouth	0.3	22	38	46	62
Hedges Creek					
At mouth	4.1	304	509	595	802
Upstream end	2.0	447	583	636	760

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Holcomb Creek					
At mouth	4.9	370	477	524	634
McKay Creek					
At mouth	66.0	4,409	6,983	7,451	8,569
At Hornecker Road	61.0	4,168	6,681	7,136	8,236
At West Union	38.7	2,811	4,328	4,603	5,271
North Johnson Creek					
At mouth	3.5	425	501	530	598
North Johnson Creek - East Tributary					
At mouth	0.3	42	52	57	67
North Johnson Creek - North Tributary					
At mouth	0.5	94	118	127	150
Nyberg Slough					
At Southwest 65th Street	694.0	16,000	23,900	33,600	48,500
Rock Creek North					
At mouth1	76.0	6,765	8,682	9,492	11,432
Downstream of Dawson Creek confluence	70.0	6,412	8,213	8,971	10,779
At S.W. 231st Avenue (Below Beaverton Creek Confluence)	63.8	5,995	7,680	8,387	10,076
Upstream of Beaverton Creek confluence	26.0	1,872	2,411	2,640	3,210
At West Union Road	19.0	1,470	1,904	2,085	2,530
Rock Creek South					
At mouth	6.2	520	660	718	873
At Sherwood Road	3.7	410	546	616	786
South Johnson Creek					
At mouth	3.6	577	730	793	940
Storey Creek					
At mouth	5.0	396	657	706	828

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Storey Creek - East Tributary					
At mouth	1.309	105	176	189	222
Storey Creek - Middle Tributary					
At mouth	1.323	100	165	176	206
Summer Creek					
At mouth	6.2	1,050	1,300	1,450	1,750
At Southwest 135th Avenue	4.0	800	1,000	1,100	1,350
Tualatin River					
At rail road crossing	690.8	16,000	26,900	33,500	48,400
At Farmington	550.9	13,800	23,200	29,000	41,800
DS of Rock creek confluence	548.6	13,700	23,100	28,900	41,700
DS of Dairy Creek confluence	462.0	12,100	20,300	25,400	36,700
DS of Golf Course Tributory	221.4	7,400	12,400	15,500	22,400
Upper end of the Tualatin River	214.3	7,200	12,100	15,200	21,900
Tualatin River - Golf Course Overflow					
At mouth	NA	1,665	2,970	3,859	5,285
Tualatin River - LaFolette Overflow					
At mouth	NA	978	1,711	2,056	3,387
Turner Creek					
At mouth	2.0	320	406	441	522
Waible Creek					
At mouth	12.0	1,045	1,692	1,815	2,113
At NW Groveland Drive (Highway 26)	3.2	180	234	297	380
At NW West Union Road	2.0	112	161	222	349
Waible Creek - South Tributary					
At mouth	1.2	220	362	387	443
At Brookwood Parkway	1.0	173	208	266	387
Waible Creek Tributary 1					
At mouth	0.4	45	56	66	80

Table 3 - Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Waible Creek Tributary 2					
At mouth	0.5	49	86	92	109
At NW West Union Road	0.4	33	47	54	56
Wapato Creek					
At mouth	22.0	650	1,150	1,400	2,000
At Washington/Yamhill County Line	13.0	550	850	1,000	1,350
West Fork Dairy Creek					
At Banks Road	46	4,200	6,090	7,010	9,630
Willow Creek					
At mouth	5.1	799	1,022	1,115	1,328
At Northwest 173rd Avenue	2.6	432	547	595	704

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Many flooding sources discussed in sections below have been revised with new revised studies. Refer to Section 10 – Revision Descriptions for details.

Hydraulic analyses for all streams studied in detail were performed using the USACE HEC-2 step-backwater computer program (Reference 16). Cross-section data used in the program came from a number of sources. Cross sections are composites of data from USACE field surveys, city topographic maps (References 17 though 21), the USGS topographic information. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Digital methods were used wherever possible to reduce redundant work effort and automate the direct transfer of data. They were used to directly convert a network of sections and alignments into section positions and distances, to convert survey data to the model cross sections, and to automatically map the 1- and 0.2-percent annual chance floodplain boundaries based on widths from the model output and to use those same data for the Floodway Data tables in a spreadsheet.

Water-surface profile computations at bridges are based on present normal bridge openings. Consideration was not given either to the possible blockage of bridge openings by sediment and debris or to future bridge enlargement.

Field surveys were made to establish stream channel profiles, cross sections, and a few high-water elevations for approximately 13.5 miles of Fanno Creek, 1.5 miles of Ash Creek, and 2.1 miles of Summer Creek. The original field surveys began in September 1997 and were completed in March 1998. Additional field surveyed cross sections on both Fanno Creek and Ash Creek were obtained by crews from the Cities of Beaverton

and Tigard and Washington County, Oregon, during the winter months of 1998-99.

The model for Unnamed Tributary of McKay Creek was calibrated using engineering judgment and information about past flooding events from local officials and residents along the Unnamed Tributary. Numerous high water marks from the January 31, 1987 flood were used in the model calibration for the entire 1.8-mile study reach.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM. Where appropriate, backwater elevations from the Tualatin River were shown on the final Flood Profiles for Fanno Creek.

Hydraulic roughness (Manning's "n" values) for the channel and overbanks were first estimated from field observations. The "n" values were then adjusted to match high-water marks where available. Tabulated "n" values are shown in Table 4 for all streams studied in detail.

Table 4. Roughness Coefficient - Manning's "n" Values

Stream	Overbank	Channel
Ash Creek	0.040 - 0.180	0.030 - 0.065
Beal Creek	0.02 - 0.07	0.07 - 0.08
Beaverton Creek	0.001 - 0.200	0.012 - 0.080
Bethany Creek	0.035 - 0.060	0.035 - 0.040
Bronson Creek	0.06 - 0.15	0.04 - 0.11
Butternut Creek	0.03 - 0.07	0.03 - 0.07
Cedar Creek	0.020 - 0.150	0.030 - 0.060
Cedar Mill Creek and tributaries	0.02 - 0.25	0.02 - 0.08
Celebrity	0.08	0.05
Chicken Creek and West Tributary	0.02 - 0.10	0.02 - 0.10
Council Creek	0.04 - 0.10	0.042 - 0.085
Dairy Creek	0.04 - 0.10	0.04 - 0.10
Dawson Creek	0.06 - 0.10	0.035 - 0.055
Deer Creek	0.035 - 0.400	0.035
Erickson Creek	0.030 - 0.065	0.03 - 0.05
Fanno Creek	0.040 - 0.120	0.043 - 0.080
Gales Creek	0.077 - 0.110	0.050 - 0.057
Glencoe Swale	0.055 - 0.100	0.030 - 0.055
Gordon Creek	0.04 - 0.06	0.035 - 0.050
Hall Creek and tributaries	0.012 - 0.100	0.02 - 0.09
Hedges Creek	0.02 - 0.10	0.02 - 0.10
Holcomb Creek	0.04 - 0.08	0.04 - 0.05
North Johnson Creek and tributaries	0.02 - 0.25	0.02 - 0.08
McKay Creek and Unnamed Tributary	0.058 - 0.110	0.058 - 0.110
Nyberg Slough	0.050 - 0.095	0.40 - 0.05
Rock Creek North	0.04 - 0.07	0.04 - 0.07
Rock Creek South	0.02 - 1.00	0.04 - 0.08
South Johnson Creek	0.05 - 0.10	0.06 - 0.08
Storey Creek and tributaries	0.04 - 0.12	0.045 - 0.065
Summer Creek	0.04 - 0.30	0.045 - 0.085
Tualatin River and overflows	0.063 - 0.120	0.047 - 0.050
Turner Creek	0.04 - 0.08	0.045 - 0.070
Waible Creek and tributaries	0.035 - 0.100	0.050 - 0.065
Wapato Creek	0.080 - 0.090	0.050 - 0.052
West Fork Dairy Creek	0.08 - 0.11	0.055 - 0.057
Willow Creek	0.04 - 0.08	0.030 - 0.065

Overbank roughness factors were based on digital aerial orthophotographs flown in 1999 by Washington County (Reference 22). Base map references of similar roughness were identified electronically as an AutoCAD layer on the aerial orthophotographs. Geographic Information System techniques were used to compute the weighted average "n" values at each of the overbanks for the surveyed cross sections. Using the techniques described above, overbank roughness values ranged from 0.04 to 0.120.

Water-surface profile computations at bridges are based on present normal bridge openings. Consideration was not given either to the possible blockage of bridge openings by sediment and debris or to future bridge enlargement.

Starting water-surface elevations (WSELs) for the Tualatin River were obtained from a hydraulic analysis performed by the USACE for the West Linn FIS (Reference 23).

Starting WSELs for Ash Creek and Summer Creek were obtained from those modeled for Fanno Creek at the point of each creek's respective confluence. Starting WSELs for Fanno Creek were based on the slope-area method; backwater from the Tualatin River taken from the City of Durham FIS report (Reference 15) is reflected on the water-surface profiles.

Both upstream and downstream elevations for the Tualatin River Side Channel and Nyberg Slough were obtained from Tualatin River profiles located at the entrance and exit of the overbank channels. For Nyberg Slough, overflow from the Tualatin River does not reach the slough for floods with less than a 6.6-percent-annual-chance frequency. Thus, the 10-percent-annual-chance flood is not shown on the profile for Nyberg Slough.

For all other steams studied in detail, starting WSELs were obtained using the normal-depth routine of the HEC-2 program.

Results of the hydraulic analyses for Council Creek showed that the 1-percent-annual-chance flood elevations for the entire reach studied in the community are below the 1-percent-annual-chance flood elevation on Dairy Creek at its confluence with Council Creek as presented in the Washington County, Oregon, Flood Insurance Study (Reference 5). Therefore, the 1- and 0.2-percent-annual-chance flood elevations and boundaries along Council Creek, as presented on the profiles and maps, are the result of backwater from Dairy Creek.

Flood profiles were drawn showing computed WSELs to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Elevations along Wapato Creek and Rock Creek are controlled by Tualatin River during a 1-percent-annual-chance flood. The profiles for the creek reflect that analysis.

New 2-foot contour maps were developed by David Smith and Associates, Inc., for Ash Creek, Fanno Creek and Summer Creek. They are based on aerial photography flown in December 1997 (Reference 24).

Approximate flood boundaries were based upon the existing Flood Plain Delineation Maps (Reference 25) and Flood Hazard Boundary Map (FHBM) (Reference 26).

Because of stream meanders, distances on the FIRM, published separately, may not agree exactly with distances on the profiles (Exhibit 1).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

To accurately convert flood elevations from the current NGVD29 datum to the newer NAVD88 datum, the following procedure was implemented. Use CORPSCON to determine whether it is necessary to use a Stream-by-

Stream or Countywide factor in the conversion. Using the FEMA protocol for determining the conversion factor (*FEMA Guidelines & Specifications – Appendix B*) the decision was made that a single, countywide conversion factor was acceptable to use in performing the datum conversion for Washington County, OR. The average datum conversion factor for Washington County is calculated to be +3.52 ft. The final NAVD88 elevations were computed by adding the calculated value to the existing NGVD29 data.

All previous elevations in Washington County have been converted from NGVD to NAVD by adding 3.52 feet. Flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD.

Flood elevations shown in this FIS report and on the FIRM are referenced to NAVD. These flood elevations must be compared to structure and ground elevation referenced to the same vertical datum. For information regarding conversion between the NGVD and NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242
(301) 713-4172 (fax)

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

To obtain current elevation, description, and/or location information for benchmarks shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevation; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles and Floodway Data tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800, and 1:2,400 with contour intervals of 2 feet and 4 feet (References 18, 19, 20, and 21).

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

The approximate 1-percent-annual-chance flood boundaries were obtained from the Floodplain Delineation Maps published by Washington County (Reference 25) and the FHBM for Washington County (Reference 26).

The approximate 1-percent-annual-chance floodplain boundaries for Hedges Creek were delineated on a topographic map at a scale of 1:24,000, with a contour interval of 10 feet (Reference 27).

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross section (see Table 5, Floodway Data). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) or the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

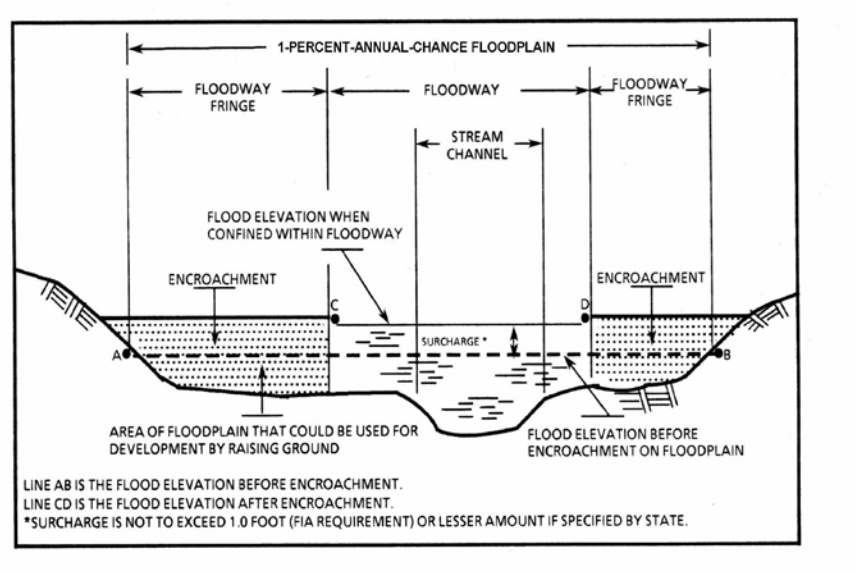


Figure 1. Floodway Schematic

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ASH CREEK								
A	0.10	60	301	3.4	164.1	160.5[2]	161.4[2]	0.9
B	0.19	26	147	7.0	164.1	162.5[2]	162.8[2]	0.3
C	0.33	116	716	1.3	164.1	164.1	164.8	0.7
D	0.41	96	440	2.1	164.2	164.2	164.9	0.7
E	0.55	70	229	4.0	164.9	164.9	165.6	0.7
F	0.72	106	441	1.9	166.0	166.0	166.7	0.7
G	0.91	66	180	4.7	167.9	167.9	168.8	0.9
H	1.08	50	248	3.1	173.3	173.3	174.3	1.0
I	1.28	18	129	5.6	177.5	177.5	178.4	0.9
J	1.39	36	158	4.6	180.6	180.6	181.5	0.9
K	1.52	56	238	2.7	184.5	184.5	185.1	0.6

[1]Stream distance in miles above confluence with Fanno Creek

[2]Elevations computed without consideration of backwater effects from Fanno Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ASH CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAL CREEK								
A	417	145	431	1.6	169.1	168.6[2]	169.3[2]	0.7
B	637	47	181	3.2	169.1	168.9[2]	169.6[2]	0.7
C	1,024	273	1,200	0.5	169.4	169.4	170.2	0.8
D	1,608	125	746	0.6	171.3	171.3	171.8	0.5
E	1,785	93	529	0.8	171.3	171.3	171.8	0.5
F	2,082	24	118	3.5	171.6	171.6	172.2	0.6
G	2,227	53	228	1.8	172.0	172.0	172.6	0.6
H	2,468	76	325	1.2	172.1	172.1	172.9	0.8
I	2,757	67	247	1.6	172.2	172.2	173.1	0.9

[1]Feet above confluence with Council Creek

[2]Elevations computed without consideration of backwater effects from Council Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
A	1,017	210	1,179	7.5	149.5	145.1[2]	146.1[2]	1.0
B	1,411	90	737	10.6	149.5	148.5[2]	148.7[2]	0.2
C	1,918	214	2,248	3.4	150.1	150.1	151.0	0.9
D	2,885	225	2,042	3.8	150.6	150.6	151.5	0.9
E	3,469	214	2,040	3.4	151.2	151.2	152.1	0.9
F	4,172	158	1,832	3.5	152.1	152.1	152.9	0.8
G	4,643	188	2,076	3.4	152.5	152.5	153.3	0.8
H	4,881	189	2,164	2.7	152.6	152.6	153.4	0.8
I	5,501	161	1,682	4.1	152.9	152.9	153.8	0.9
J	5,667	172	1,957	3.6	153.6	153.6	154.4	0.8
K	5,941	190	2,217	3.0	153.8	153.8	154.6	0.8
L	6,388	193	2,195	3.5	154.0	154.0	154.9	0.9
M	6,501	71	918	6.8	155.5	155.5	155.8	0.3
N	7,041	190	2,565	2.7	156.6	156.6	157.1	0.5
O	7,386	200	2,636	1.9	156.7	156.7	157.1	0.4
P	7,870	195	2,632	2.5	156.8	156.8	157.3	0.5
Q	8,519	204	2,537	2.6	156.9	156.9	157.5	0.6
R	9,367	198	2,718	2.4	157.1	157.1	157.8	0.7
S	10,104	198	2,561	2.2	157.3	157.3	158.0	0.7
T	10,576	270	3,367	2.0	157.4	157.4	158.2	0.8
U	11,391	329	3,870	1.5	157.5	157.5	158.4	0.9
V	12,068	300	3,716	1.8	158.0	158.0	158.8	0.8
W	13,094	240	2,508	2.4	158.0	158.0	158.9	0.9
X	13,970	230	2,422	2.5	158.2	158.2	159.1	0.9
Y	14,307	220	2,306	2.5	158.3	158.3	159.2	0.9
Z	14,753	216	2,121	2.8	158.5	158.5	159.4	0.9

[1]Feet above confluence with Rock Creek North

[2]Elevations computed without consideration of backwater effects from Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
AA	15,159	214	2,395	2.4	158.7	158.7	159.6	0.9
AB	15,551	220	2,306	2.7	158.8	158.8	159.8	1.0
AC	15,936	220	2,283	2.6	159.0	159.0	159.9	0.9
AD	16,368	120	1,225	5.1	159.3	159.3	160.1	0.8
AE	16,554	156	1,824	3.3	160.0	160.0	160.8	0.8
AF	17,052	158	1,816	3.2	160.2	160.2	161.0	0.8
AG	17,214	209	2,411	2.4	161.1	161.1	162.0	0.9
AH	18,009	215	2,497	2.4	161.2	161.2	162.2	1.0
AI	18,324	184	2,156	2.8	161.3	161.3	162.3	1.0
AJ	18,630	198	2,251	2.9	161.5	161.5	162.4	0.9
AK	18,926	190	2,212	2.6	161.5	161.5	162.5	1.0
AL	19,473	169	2,099	2.7	161.7	161.7	162.7	1.0
AM	20,062	226	1,959	2.9	162.0	162.0	162.9	0.9
AN	21,311	285	2,545	2.2	162.3	162.3	163.3	1.0
AO	21,903	276	2,331	2.4	162.4	162.4	163.4	1.0
AP	22,411	213	1,975	2.3	162.6	162.6	163.6	0.9
AQ	22,864	187	2,241	1.9	162.8	162.8	163.8	0.9
AR	23,366	166	1,764	2.9	163.0	163.0	163.9	0.9
AS	23,533	69	791	5.5	163.1	163.1	164.0	0.9
AT	24,090	281	2,549	2.2	164.0	164.0	164.8	0.8
AU	24,594	254	2,100	2.8	164.1	164.1	164.9	0.8
AV	26,374	83	602	9.3	164.7	164.7	165.4	0.7
AW	27,108	213	1,715	3.3	166.9	166.9	167.3	0.4
AX	27,789	224	1,832	3.5	167.2	167.2	167.6	0.4
AY	28,237	264	2,008	3.1	167.4	167.4	167.7	0.3
AZ	28,773	251	1,762	3.7	167.6	167.6	167.9	0.3

[1]Feet above confluence with Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
BA	30,064	327	1,959	3.5	167.8	167.8	168.2	0.4
BB	31,158	241	1,331	4.6	168.3	168.3	168.6	0.3
BC	31,555	64	520	8.8	168.7	168.7	168.8	0.1
BD	31,751	112	876	6.7	170.0	170.0	170.2	0.2
BE	32,190	199	1,700	3.1	170.3	170.3	171.2	0.9
BF	32,458	186	1,362	4.8	170.3	170.3	171.2	0.9
BG	33,321	332	2,531	1.7	170.7	170.7	171.6	0.9
BH	33,852	339	2,378	1.6	170.7	170.7	171.6	0.9
BI	34,114	243	2,264	1.6	170.8	170.8	171.7	0.9
BJ	34,661	204	2,069	1.7	170.8	170.8	171.7	0.9
BK	35,077	207	1,959	1.8	170.9	170.9	171.8	0.9
BL	35,351	211	2,033	1.7	170.9	170.9	171.8	0.9
BM	35,580	205	1,924	1.8	170.9	170.9	171.8	0.9
BN	36,047	203	1,953	2.0	171.0	171.0	171.9	0.9
BO	36,530	213	2,013	1.8	171.0	171.0	171.9	0.9
BP	37,255	117	1,089	2.5	171.1	171.1	172.0	0.9
BQ	37,487	127	1,221	3.0	171.2	171.2	172.0	0.8
BR	37,868	135	735	3.7	171.4	171.4	172.2	0.8
BS	38,285	382	3,522	1.0	171.9	171.9	172.9	1.0
BT	39,137	211	1,824	1.5	171.9	171.9	172.9	1.0
BU	39,433	98	712	2.7	171.9	171.9	172.8	0.9
BV	39,765	82	1,118	1.7	172.6	172.6	173.5	0.9
BW	40,440	90	832	2.2	172.7	172.7	173.6	0.9
BX	40,624	70	837	1.9	173.2	173.2	174.1	0.9
BY	40,845	84	671	3.4	173.2	173.1	174.0	0.9
BZ	41,120	77	637	3.5	173.2	173.2	174.1	0.9

[1]Feet above confluence with Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
CA	41,285	86	264	5.9	173.2	173.2	174.0	0.8
CB	41,535	96	520	3.0	174.8	174.8	175.6	0.8
CC	41,898	120	1,514	1.4	177.4	177.4	178.0	0.6
CD	42,010	60	587	2.6	177.4	177.4	178.0	0.6
CE	42,363	60	582	2.7	177.4	177.4	178.1	0.7
CF	42,547	53	519	3.0	177.6	177.6	178.3	0.7
CG	42,653	80	753	2.0	177.7	177.7	178.4	0.7
CH	43,303	181	1,269	1.3	177.8	177.8	178.5	0.7
CI	43,417	181	1,270	1.3	177.8	177.8	178.5	0.7
CJ	43,569	175	1,467	1.7	178.1	178.1	179.1	1.0
CK	44,047	176	1,443	1.8	178.1	178.1	179.1	1.0
CL	44,963	187	1,347	1.2	178.2	178.2	179.2	1.0
CM	45,438	46	414	3.6	178.2	178.2	179.1	0.9
CN	45,632	65	457	3.3	178.5	178.5	179.4	0.9
CO	46,148	134	698	2.1	179.5	179.5	180.2	0.7
CP	46,252	53	452	3.5	179.5	179.5	180.2	0.7
CQ	46,810	63	491	3.1	179.7	179.7	180.5	0.8
CR	46,949	61	503	2.9	179.9	179.9	180.8	0.9
CS	47,249	91	797	1.9	180.0	180.0	180.9	0.9
CT	47,459	146	1,857	0.8	180.1	180.1	181.0	0.9
CU	48,022	35	485	2.9	180.2	180.2	181.1	0.9
CV	48,402	95	618	2.4	180.5	180.5	181.5	1.0
CW	48,694	103	653	4.2	180.6	180.6	181.4	0.8
CX	49,093	46	105	1.4	182.2	182.2	182.9	0.7
CY	49,415	65	180	0.8	182.3	182.3	182.9	0.6
CZ	49,688	30	121	0.2	182.3	182.3	182.9	0.6

[1]Feet above confluence with Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
DA	49,807	30	15	1.3	182.7	182.7	182.9	0.2
DB	50,296	13	5	3.7	183.3	183.3	183.4	0.1
DC	50,513	82	315	0.1	183.3	183.3	183.7	0.4
DD	50,857	39	150	0.1	183.3	183.3	183.7	0.4
DE	51,109	34	144	0.1	183.3	183.3	183.7	0.4
DF	51,446	115	627	0.7	183.3	183.3	183.7	0.4
DG	51,730	45	255	1.3	183.4	183.4	183.7	0.3
DH	52,007	34	178	1.9	183.4	183.4	183.8	0.4
DI	52,457	28	349	0.5	189.1	189.1	189.5	0.4
DJ	52,670	25	324	0.7	189.1	189.1	189.5	0.4
DK	52,780	32	303	0.8	189.1	189.1	189.5	0.4
DL	53,025	30	59	2.4	189.1	189.1	189.6	0.5
DM	53,626	30	26	5.3	195.6	195.6	195.8	0.2
DN	53,795	30	26	5.3	196.9	196.9	197.3	0.4
DO	54,275	30	27	5.0	200.2	200.2	200.6	0.4
DP	54,598	89	59	5.6	203.2	203.2	203.3	0.1
DQ	54,946	105	52	5.3	208.5	208.5	208.6	0.1
DR	55,219	30	67	2.1	208.8	208.8	209.0	0.2
DS	55,483	30	128	1.1	208.8	208.8	209.1	0.3
DT	55,702	9	80	2.1	208.8	208.8	209.1	0.3
DU	56,057	69	200	1.7	208.8	208.8	209.3	0.5
DV	56,143	63	260	1.3	208.8	208.8	209.4	0.6
DW	56,362	17	44	3.9	208.9	208.9	209.3	0.4
DX	56,513	15	63	3.0	210.6	210.6	211.5	0.9
DY	56,796	13	44	4.4	211.4	211.4	212.2	0.8
DZ	56,883	23	18	5.1	215.6	215.6	215.8	0.2

[1]Feet above confluence with Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BEAVERTON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BEAVERTON CREEK								
EA	56,987	30	26	3.5	216.2	216.2	216.4	0.2
EB	57,104	31	35	2.6	216.8	216.8	217.0	0.2
EC	57,389	36	53	1.7	218.8	218.8	219.0	0.2
ED	57,711	14	74	1.2	222.3	222.3	222.9	0.6
EE	57,794	11	74	2.3	222.3	222.3	222.9	0.6
EF	57,958	24	92	1.8	222.3	222.3	223.1	0.8
EG	59,692	56	377	0.2	244.9	244.9	245.0	0.1
EH	59,945	23	72	1.1	245.1	245.1	245.2	0.1
EI	60,121	20	46	1.7	245.4	245.4	245.5	0.1
EJ	60,420	6	20	3.9	247.0	247.0	247.2	0.2
EK	60,531	6	21	3.7	247.3	247.3	247.4	0.1
EL	60,725	8	18	4.3	250.5	250.5	251.0	0.5
EM	60,916	16	65	1.3	259.1	259.1	259.4	0.3
EN	61,362	6	11	7.4	260.4	260.4	260.4	0.0
EO	61,511	7	23	3.5	264.0	264.0	264.7	0.7
EP	61,774	7	28	2.8	266.6	266.6	267.4	0.8

[1]Feet above confluence with Rock Creek North

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BETHANY CREEK								
A	351	279	1,382	0.4	173.5	172.5[2]	173.3[2]	0.8
B	675	279	1,507	0.3	173.5	172.5[2]	173.3[2]	0.8
C	1,250	182	989	0.5	173.5	172.5[2]	173.3[2]	0.8
D	1,907	20	98	5.2	173.5	173.4[2]	173.6[2]	0.2
E	2,917	60	158	3.3	175.9	175.9	176.8	0.9
F	3,449	41	115	4.0	176.5	176.5	177.5	1.0
G	4,110	40	145	3.4	180.9	180.9	180.9	0.0
H	4,558	56	154	2.5	181.3	181.3	181.5	0.2
I	4,764	33	122	3.8	181.8	181.8	182.6	0.8
J	5,105	40	86	5.6	182.6	182.6	183.3	0.7
K	5,618	39	70	3.1	184.7	184.7	185.0	0.3
L	5,946	44	40	5.8	187.9	187.9	187.9	0.0

[1]Feet above confluence with Rock Creek North

[2]Elevations computed without consideration of backwater effects from Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BETHANY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BRONSON CREEK								
A	419	145	443	2.0	158.0	151.5[2]	151.5[2]	0.0
B	751	85	274	2.4	158.0	151.9[2]	152.2[2]	0.3
C	977	18	261	3.8	160.3	160.3	160.9	0.6
D	1,483	190	1,760	0.6	160.4	160.4	161.2	0.8
E	1,776	225	1,774	0.6	160.5	160.5	161.2	0.7
F	2,053	191	1,134	0.7	160.5	160.5	161.2	0.7
G	2,326	199	995	0.8	160.6	160.6	161.2	0.6
H	2,619	157	645	1.3	160.7	160.7	161.3	0.6
I	3,148	130	491	1.5	161.1	161.1	161.6	0.5
J	3,681	125	410	2.2	161.7	161.7	162.2	0.5
K	3,947	113	284	3.0	162.4	162.4	162.8	0.4
L	4,009	60	237	3.3	167.3	167.3	167.8	0.5
M	4,598	81	544	1.4	167.7	167.7	168.2	0.5
N	5,179	139	696	1.4	167.8	167.8	168.7	0.9
O	5,968	34	234	2.8	172.0	172.0	172.0	0.0
P	6,155	58	410	1.7	172.5	172.5	173.3	0.8
Q	6,540	133	1,351	0.5	172.6	172.6	173.3	0.7
R	6,878	85	314	2.3	172.6	172.6	173.3	0.7
S	7,266	85	529	1.3	172.8	172.8	173.7	0.9
T	7,486	30	196	3.4	173.1	173.1	173.9	0.8
U	7,727	80	519	1.2	173.6	173.6	174.3	0.7
V	7,954	20	90	7.2	173.6	173.6	174.3	0.7
W	8,166	40	177	3.8	176.8	176.8	177.0	0.2
X	8,545	175	1,023	0.6	178.2	178.2	178.8	0.6
Y	8,805	199	793	0.8	183.3	183.3	183.5	0.2
Z	9,283	266	1,468	0.4	183.3	183.3	183.6	0.3

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BRONSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BRONSON CREEK								
AA	9,660	196	1,049	0.6	183.3	183.3	183.6	0.3
AB	10,101	236	1,878	0.3	185.0	185.0	185.3	0.3
AC	10,422	130	914	0.7	185.0	185.0	185.3	0.3
AD	10,764	24	135	4.6	185.0	185.0	185.2	0.2
AE	10,966	21	162	4.4	187.2	187.2	187.6	0.4
AF	11,260	76	563	1.2	187.2	187.2	188.1	0.9
AG	11,712	65	223	3.2	187.7	187.7	188.5	0.8
AH	11,880	36	152	4.5	188.3	188.3	188.9	0.6
AI	12,114	20	115	5.7	192.7	192.7	193.3	0.6
AJ	12,244	52	327	1.9	194.3	194.3	194.6	0.3
AK	12,333	106	630	1.3	194.9	194.9	195.7	0.8
AL	12,534	162	843	0.9	195.0	195.0	195.7	0.7
AM	12,902	172	693	1.1	195.1	195.1	195.8	0.7
AN	13,149	161	518	1.6	195.2	195.2	196.0	0.8
AO	13,518	118	380	1.5	195.6	195.6	196.5	0.9
AP	13,979	115	227	2.5	197.1	197.1	197.6	0.5
AQ	14,303	118	356	1.7	198.0	198.0	198.6	0.6
AR	15,312	126	308	2.1	199.8	199.8	200.8	1.0
AS	15,464	132	310	2.2	200.6	200.6	201.6	1.0
AT	15,757	114	318	2.4	201.8	201.8	202.8	1.0
AU	16,548	113	290	2.3	204.4	204.4	205.2	0.8
AV	16,802	134	361	1.6	205.1	205.1	206.0	0.9
AW	17,402	161	336	2.2	206.6	206.6	207.6	1.0
AX	17,846	163	236	3.3	209.1	209.1	210.0	0.9
AY	18,225	97	235	2.5	212.2	212.2	213.2	1.0
AZ	18,477	70	228	3.1	213.6	213.6	214.4	0.8

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BRONSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BRONSON CREEK								
BA	19,047	97	310	1.9	216.7	216.7	217.3	0.6
BB	19,314	104	282	1.6	217.0	217.0	217.9	0.9
BC	19,741	89	213	2.1	218.2	218.2	219.2	1.0
BD	20,519	142	360	1.5	220.7	220.7	221.7	1.0
BE	20,946	26	81	6.5	223.1	223.1	223.9	0.8
BF	21,117	44	105	5.0	225.0	225.0	225.5	0.5
BG	21,674	92	282	1.9	227.4	227.4	228.4	1.0
BH	22,346	151	279	2.0	229.0	229.0	229.9	0.9
BI	22,974	172	255	1.5	232.7	232.7	233.2	0.5
BJ	23,737	224	326	1.1	237.3	237.3	237.3	0.0
BK	24,134	26	71	5.5	238.2	238.2	239.0	0.8
BL	24,705	40	148	2.9	243.4	243.4	244.2	0.8
BM	25,210	50	132	3.3	246.2	246.2	246.6	0.4
BN	25,470	56	136	3.6	247.9	247.9	248.5	0.6
BO	25,871	80	166	2.4	249.6	249.6	250.2	0.6
BP	26,223	149	248	2.0	250.3	250.3	251.4	1.1
BQ	26,398	17	53	6.2	251.1	251.1	252.1	1.0
BR	26,734	90	228	1.6	255.0	255.0	255.5	0.5
BS	27,268	18	55	6.0	256.2	256.2	257.2	1.0
BT	27,968	31	117	2.8	264.1	264.1	264.3	0.2
BU	28,532	120	207	2.3	266.7	266.7	267.0	0.3
BV	28,736	39	106	3.4	272.4	272.4	272.6	0.2

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BRONSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BUTTERNUT CREEK								
A	971	27	111	9.1	144.3	125.5[2]	125.9[2]	0.4
B	1,193	88	638	2.0	144.3	133.3[2]	133.4[2]	0.1
C	1,891	49	344	2.8	144.3	133.5[2]	133.5[2]	0.0
D	3,023	169	454	2.8	144.3	134.2[2]	134.6[2]	0.4
E	3,976	107	318	3.8	144.3	135.9[2]	136.3[2]	0.4
F	4,505	101	326	3.2	144.3	137.0[2]	137.9[2]	0.9
G	5,376	91	274	3.9	144.3	139.4[2]	140.3[2]	0.9
H	6,023	74	207	5.2	144.3	141.5[2]	142.5[2]	1.0
I	6,698	80	288	3.7	144.3	143.8[2]	144.5[2]	0.7
J	6,882	72	719	1.3	150.7	150.7	151.4	0.7
K	7,450	88	773	1.2	150.7	150.7	151.5	0.8
L	8,584	99	717	1.4	150.7	150.7	151.6	0.9
M	9,293	97	574	1.8	150.8	150.8	151.7	0.9
N	9,447	50	399	2.5	151.1	151.1	152.1	1.0
O	10,251	77	512	2.0	151.5	151.5	152.5	1.0
P	11,130	44	197	4.3	152.1	152.1	153.1	1.0
Q	11,679	89	419	2.3	153.6	153.6	154.4	0.8
R	12,503	85	372	2.4	154.2	154.2	155.2	1.0
S	13,904	68	219	4.0	157.5	157.5	158.3	0.8
T	14,725	70	286	2.8	160.9	160.9	161.5	0.6
U	15,861	61	211	4.4	163.3	163.3	164.2	0.9
V	16,842	46	204	3.8	166.5	166.5	166.9	0.4
W	17,104	51	240	3.4	167.0	167.0	167.5	0.5
X	17,378	58	439	1.3	170.5	170.5	171.4	0.9
Y	17,706	69	480	1.1	170.6	170.6	171.5	0.9
Z	17,942	70	404	1.8	170.7	170.7	171.6	0.9

[1]Feet above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BUTTERNUT CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
BUTTERNUT CREEK								
AA	18,222	64	190	3.8	171.1	171.1	171.8	0.7
AB	18,906	91	451	1.5	172.3	172.3	173.0	0.7
AC	19,059	55	287	2.4	173.1	173.1	173.5	0.4
AD	19,340	54	254	2.9	173.5	173.5	173.9	0.4
AE	19,850	70	177	4.7	174.9	174.9	175.3	0.4
AF	20,452	24	95	4.6	177.2	177.2	177.8	0.6
AG	20,933	25	118	4.0	179.5	179.5	180.1	0.6
AH	21,396	32	125	3.7	180.7	180.7	181.7	1.0
AI	21,945	36	124	3.6	182.9	182.9	183.8	0.9
AJ	22,200	45	208	2.0	185.1	185.1	186.0	0.9
AK	22,384	54	191	2.2	185.4	185.4	186.3	0.9
AL	22,964	12	40	10.6	187.5	187.5	188.0	0.5
AM	23,466	27	88	5.1	192.3	192.3	193.3	1.0
AN	24,440	23	118	2.3	195.4	195.4	195.6	0.2
AO	24,666	20	75	3.9	195.5	195.5	195.8	0.3
AP	25,050	18	68	4.2	196.3	196.3	197.3	1.0
AQ	25,448	38	113	1.6	197.7	197.7	198.2	0.5
AR	25,601	33	113	1.6	198.7	198.7	199.1	0.4
AS	25,799	20	85	2.2	198.8	198.8	199.3	0.5
AT	25,881	23	81	2.3	199.0	199.0	199.4	0.4
AU	26,063	31	123	1.5	199.5	199.5	200.5	1.0
AV	26,502	49	146	1.4	199.9	199.9	200.8	0.9
AW	26,728	48	236	0.7	199.9	199.9	200.8	0.9
AX	26,909	16	50	3.1	200.1	200.1	201.1	1.0

[1]Feet above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

BUTTERNUT CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CEDAR CREEK								
A	445	20	148	6.5	144.2	139.3[2]	139.9[2]	0.6
B	939	40	227	5.4	144.2	143.4[2]	143.9[2]	0.5
C	1,319	40	305	4.3	145.2	145.2	145.6	0.4
D	1,682	100	625	2.1	145.8	145.8	146.2	0.4
E	2,125	65	423	3.1	146.1	146.1	146.5	0.4
F	2,440	60	386	3.3	146.4	146.4	146.9	0.5
G	2,964	57	378	3.0	147.2	147.2	147.7	0.5
H	3,190	50	518	2.2	150.2	150.2	150.7	0.5
I	3,588	151	1,232	1.1	150.6	150.6	151.2	0.6
J	3,958	125	943	1.5	150.6	150.6	151.2	0.6
K	4,584	70	517	2.6	150.9	150.9	151.5	0.6
L	5,291	61	516	1.7	151.5	151.5	152.1	0.6
M	5,646	32	441	2.0	156.8	156.8	157.4	0.6
N	6,789	82	763	2.1	157.6	157.6	158.2	0.6
O	7,311	130	1,334	1.4	157.8	157.8	158.4	0.6
P	8,229	135	990	2.0	158.1	158.1	158.7	0.6
Q	9,142	82	559	2.9	158.9	158.9	159.4	0.5
R	9,731	38	331	4.5	160.4	160.4	160.8	0.4
S	9,913	96	855	1.5	162.0	162.0	162.9	0.9
T	10,462	195	1,567	1.3	162.1	162.1	163.0	0.9
U	10,824	168	1,353	1.4	162.2	162.2	163.1	0.9
V	11,560	141	617	3.0	162.6	162.6	163.6	1.0
W	12,407	189	1,178	1.5	163.8	163.8	164.4	0.6
X	12,767	42	756	2.1	173.6	173.6	174.2	0.6
Y	13,440	86	1,303	1.0	173.7	173.7	174.4	0.7
Z	14,785	58	693	1.8	173.7	173.7	174.6	0.9
AA	14,886	170	1,011	1.7	175.4	175.4	175.7	0.3
AB	15,431	242	2,483	1.0	175.5	175.5	175.8	0.3

[1]Feet above confluence with Chicken Creek

[2]Elevations computed without consideration of backwater effects from Chicken Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CEDAR CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CEDAR MILL CREEK								
A	720	176	476	3.3	170.7	168.9[2]	169.6[2]	0.7
B	1,309	130	472	3.4	170.7	170.8	171.7	0.9
C	1,680	163	639	3.0	171.4	171.4	172.5	1.1
D	2,500	177	591	3.2	172.8	172.8	173.7	0.9
E	3,458	293	456	3.2	173.7	173.7	174.6	0.9
F	3,796	44	393	3.6	181.1	181.1	181.1	0.0
G	4,106	40	399	3.4	181.1	181.1	181.6	0.5
H	4,418	198	1,304	1.1	181.1	181.1	181.8	0.7
I	4,815	326	1,907	0.7	181.2	181.2	181.9	0.7
J	5,163	301	736	2.4	182.1	182.1	182.4	0.3
K	5,723	52	403	3.3	182.2	182.2	182.6	0.4
L	6,062	91	644	1.9	182.7	182.7	183.3	0.6
M	6,216	56	422	2.7	182.8	182.8	183.4	0.6
N	6,600	77	551	2.1	183.0	183.0	183.7	0.7
O	7,283	127	615	2.1	183.4	183.4	184.0	0.6
P	7,435	98	410	3.2	183.5	183.5	184.1	0.6
Q	7,705	100	395	3.7	184.0	184.0	184.5	0.5
R	7,979	124	642	2.0	184.4	184.4	185.0	0.6
S	8,218	173	735	1.8	184.5	184.5	185.2	0.7
T	8,448	153	847	1.8	184.9	184.9	185.4	0.5
U	8,652	181	956	1.2	184.9	184.9	185.5	0.6
V	8,961	64	266	4.8	186.0	186.0	186.0	0.0
W	9,310	80	468	1.6	188.8	188.8	189.7	0.9
X	9,651	90	392	2.2	188.9	188.9	189.8	0.9
Y	9,896	96	317	2.4	189.2	189.2	190.1	0.9
Z	10,161	60	221	3.3	191.0	191.0	191.7	0.7

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CEDAR MILL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CEDAR MILL CREEK								
AA	10,496	31	154	4.7	194.6	194.6	194.6	0.0
AB	10,683	55	180	4.7	195.9	195.9	196.2	0.3
AC	11,213	31	184	4.0	198.3	198.3	199.1	0.8
AD	11,440	58	186	4.7	198.9	198.9	199.9	1.0
AE	11,740	60	168	5.3	201.9	201.9	202.5	0.6
AF	12,247	29	215	3.4	204.7	204.7	205.6	0.9
AG	13,193	19	101	4.7	207.7	207.1	207.7	0.6
AH	13,629	20	112	4.2	210.0	210.0	210.0	0.0
AI	13,787	27	84	5.6	212.4	212.3	212.4	0.1
AJ	13,897	30	203	2.3	213.0	213.0	213.0	0.0
AK	14,316	31	169	4.1	213.8	213.7	213.8	0.1
AL	14,823	29	202	3.5	215.4	215.1	215.4	0.3
AM	15,007	19	104	6.1	216.0	215.4	216.0	0.6
AN	15,250	18	118	5.3	218.2	217.7	218.2	0.5
AO	15,639	20	137	4.6	220.9	220.6	220.9	0.3
AP	15,851	8	80	7.9	224.0	223.4	224.0	0.6
AQ	16,173	34	233	2.7	225.3	224.9	225.3	0.4
AR	16,540	69	264	2.4	227.6	226.7	227.6	0.9
AS	16,746	17	124	5.1	229.0	228.5	229.0	0.5
AT	16,880	46	240	2.9	229.7	228.9	229.7	0.8
AU	17,053	145	299	2.8	232.7	231.8	232.7	0.9
AV	17,712	19	109	6.4	234.2	233.7	234.2	0.5
AW	18,405	29	179	4.0	239.4	239.0	239.4	0.4
AX	18,853	32	144	5.7	242.2	241.4	242.2	0.8
AY	19,549	45	193	3.6	248.7	247.7	248.7	1.0
AZ	20,008	25	124	5.6	252.5	252.2	252.5	0.3

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CEDAR MILL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CEDAR MILL CREEK								
BA	20,278	78	363	2.0	280.4	280.1	280.4	0.3
BB	20,395	59	381	1.7	280.5	280.2	280.5	0.3
BC	20,793	82	355	2.1	280.8	280.3	280.8	0.5
BD	21,460	60	161	4.9	282.3	282.0	282.3	0.3
BE	21,641	44	176	4.0	283.3	282.7	283.3	0.6
BF	21,851	21	72	8.2	284.5	284.2	284.5	0.3
BG	22,052	18	89	6.5	288.7	287.7	288.7	1.0
BH	22,199	24	154	3.5	292.7	291.9	292.7	0.8
BI	22,453	126	195	4.3	300.3	300.3	300.3	0.0

[1]Feet above confluence with Beaverton Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CEDAR MILL CREEK NORTH OVERFLOW								
A	83	169	340	0.7	206.6	206.6	207.3	0.7
B	336	35	62	3.7	207.2	207.2	207.8	0.6
C	427	31	37	6.2	208.0	208.0	208.1	0.1
D	799	24	34	6.8	210.9	210.9	211.0	0.1
E	1,133	104	67	3.4	211.9	211.9	212.2	0.3

[1]Feet above confluence with Cedar Mill Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CEDAR MILL CREEK NORTH OVERFLOW

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CELEBRITY CREEK								
A	326	21	94	2.2	179.2	179.2	179.9	0.7
B	526	14	60	3.4	179.6	179.6	180.2	0.6
C	710	7	41	6.3	179.9	179.9	180.6	0.7
D	1,020	19	73	2.8	181.5	181.5	181.7	0.2
E	1,134	21	97	2.1	182.0	182.0	182.6	0.6
F	1,445	18	84	2.4	182.4	182.4	182.9	0.5
G	1,568	19	58	3.5	183.1	183.1	183.7	0.6
H	1,714	21	88	2.3	183.6	183.6	184.1	0.5
I	1,917	19	77	2.6	183.8	183.8	184.3	0.5
J	2,070	19	65	3.1	184.2	184.2	184.7	0.5
K	2,328	13	46	4.4	186.4	186.4	186.7	0.3
L	2,517	18	55	3.1	187.7	187.7	188.0	0.3
M	2,666	21	94	1.8	188.6	188.6	189.1	0.5
N	2,796	19	53	3.3	188.8	188.8	189.5	0.7
O	3,115	20	48	5.2	191.7	191.7	192.7	1.0
P	3,431	23	51	4.7	194.2	194.2	195.1	0.9
Q	3,718	19	47	4.2	195.6	195.6	196.5	0.9
R	3,939	12	35	4.4	197.2	197.2	197.6	0.4
S	4,074	12	37	4.0	197.8	197.8	198.6	0.8
T	4,255	12	38	3.9	199.1	199.1	200.1	1.0
U	4,459	12	35	4.9	201.2	201.2	201.4	0.2
V	4,831	23	37	5.0	204.5	204.5	204.7	0.2
W	5,215	14	24	7.0	206.1	206.1	206.4	0.3
X	5,550	25	34	4.9	211.8	211.8	211.8	0.0

[1]Feet above confluence with Butternut Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CELEBRITY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
CHICKEN CREEK								
A	2,316	45	381	4.1	134.4	132.0[3]	132.5[3]	0.5
B	2,540	93	409	3.9	134.4	134.0[3]	134.1[3]	0.1
C	3,065	117	596	2.9	134.9	134.9	135.0	0.1
D	4,074	110	694	3.5	135.9	135.9	136.1	0.2
E	7,110	130	634	4.1	139.5	139.5	139.9	0.4
F	7,299	57	363	5.7	141.1	141.1	141.2	0.1
G	8,632	50	473	4.0	144.1	144.1	144.8	0.7
H	11,383	109	305	4.8	149.6	149.6	150.4	0.8
I	12,425	165	1,119	1.9	151.0	151.0	151.6	0.6
J	13,121	200	1,105	1.4	151.2	151.2	151.9	0.7
K	13,273	67	581	2.1	153.8	153.8	154.5	0.7
L	14,049	92	632	1.8	153.8	153.8	154.6	0.8
M	15,132	70	356	4.1	154.1	154.1	154.8	0.7
N	15,243	92	239	4.6	157.2	157.2	158.0	0.8
CHICKEN CREEK WEST TRIBUTARY								
A	751[2]	32	185	3.1	153.3	153.3	154.1	0.8
B	1,512[2]	32	140	3.2	156.3	156.3	157.1	0.8

[1]Feet above confluence with Tualatin River

[2]Feet above confluence with Chicken Creek

[3]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

CHICKEN CREEK - CHICKEN CREEK WEST TRIBUTARY

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
COUNCIL CREEK								
A	2,783	248	1,107	1.9	156.3	143.3[2]	144.1[2]	0.8
B	3,662	298	1,196	1.4	156.3	143.6[2]	144.5[2]	0.9
C	4,250	63	285	5.9	156.3	143.6[2]	144.6[2]	1.0
D	4,432	57	310	5.8	156.3	146.7[2]	146.9[2]	0.2
E	5,015	97	792	2.5	156.3	148.2[2]	149.0[2]	0.8
F	7,942	166	1,074	1.6	156.3	149.6[2]	150.6[2]	1.0
G	8,348	164	968	2.6	156.3	149.9[2]	150.8[2]	0.9
H	8,543	71	482	3.6	156.3	150.5[2]	151.3[2]	0.8
I	8,958	128	779	1.7	156.3	151.1[2]	152.0[2]	0.9
J	10,928	172	968	1.5	156.3	151.9[2]	152.6[2]	0.7
K	13,467	44	339	4.9	156.3	153.7[2]	154.3[2]	0.6
L	13,968	114	658	2.8	156.3	155.3[2]	155.9[2]	0.6
M	16,971	139	1,052	1.9	156.3	155.8[2]	156.5[2]	0.7
N	18,557	139	840	1.8	156.3	156.3	156.9	0.6
O	19,373	39	408	4.4	157.1	157.1	157.8	0.7
P	21,282	57	562	2.8	160.1	160.1	160.3	0.2
Q	22,478	145	1,196	1.3	160.6	160.6	160.9	0.3
R	22,671	106	727	2.1	160.8	160.8	161.1	0.3
S	23,311	76	828	1.9	165.0	165.0	166.0	1.0
T	23,641	183	823	2.2	165.1	165.1	166.1	1.0
U	24,727	169	869	1.9	165.5	165.5	166.5	1.0
V	25,111	174	1,182	0.9	165.6	165.6	166.5	0.9
W	28,143	175	794	0.8	165.8	165.8	166.8	1.0
X	30,233	180	444	3.3	169.0	169.0	169.9	0.9
Y	31,294	227	857	0.3	169.3	169.3	170.2	0.9
Z	32,610	22	149	2.9	172.1	172.1	172.7	0.6

[1]Feet above confluence with Dairy Creek

[2]Elevations computed without consideration of backwater effects from Dairy Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
COUNCIL CREEK								
AA	33,061	120	778	0.7	172.1	172.1	172.9	0.8
AB	33,727	103	627	0.8	172.1	172.1	173.0	0.9
AC	34,070	82	486	0.3	172.2	172.2	173.0	0.8
AD	35,087	116	519	0.3	172.2	172.2	173.0	0.8
AE	35,235	101	389	0.3	172.2	172.2	173.0	0.8

[1]Feet above confluence with Dairy Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

COUNCIL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
DAIRY CREEK								
A	3,512	984	15,983	1.4	152.3	152.3	153.1	0.8
B	5,485	1,222	17,350	1.7	152.3	152.3	153.2	0.9
C	9,167	345	6,445	6.8	153.1	153.1	154.1	1.0
D	9,713	661	10,203	3.3	153.7	153.7	154.6	0.9
E	11,136	380	5,003	7.9	153.7	153.7	154.7	1.0
F	11,438	370	6,628	4.1	155.6	155.6	156.4	0.8
G	11,842	1,078	20,232	1.2	156.0	156.0	156.9	0.9
H	12,157	1,362	12,460	2.9	156.1	156.1	157.0	0.9
I	14,863	1,576	29,815	0.5	156.3	156.3	157.2	0.9
J	16,220	1,587	21,143	0.9	156.3	156.3	157.2	0.9
K	19,998	1,624	22,317	0.9	156.3	156.3	157.2	0.9
L	24,827	1,362	20,267	0.8	156.3	156.3	157.3	1.0
M	27,542	770	9,691	1.6	156.4	156.4	157.4	1.0
N	29,088	1,437	10,703	1.0	156.6	156.6	157.7	1.1
O	32,530	1,017	10,678	0.4	156.9	156.9	158.0	1.1
P	33,566	1,036	10,309	1.5	158.9	158.9	159.7	0.8

[1] Feet Above Confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

DAIRY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
DAWSON CREEK								
A	398	143	573	3.3	147.1	137.3[2]	138.3[2]	1.0
B	1,563	82	217	7.1	147.1	138.5[2]	139.5[2]	0.9
C	1,959	45	289	4.9	147.1	145.7[2]	145.7[2]	0.0
D	2,616	65	383	2.7	147.1	146.2[2]	146.6[2]	0.4
E	3,277	80	325	3.9	147.1	146.7[2]	147.3[2]	0.6
F	3,699	80	320	3.9	147.5	147.5	148.1	0.6
G	4,034	139	809	1.6	151.3	151.3	152.2	0.9
H	4,602	160	846	1.3	151.4	151.4	152.3	0.9
I	5,709	151	613	1.9	151.8	151.7	152.5	0.8
J	6,366	70	286	3.3	152.3	152.3	153.0	0.7
K	6,985	55	213	4.6	154.3	154.3	155.1	0.8
L	7,343	54	254	2.9	155.0	155.0	156.0	1.0
M	7,726	58	220	4.3	155.9	155.9	156.7	0.8
N	8,397	93	321	4.3	158.2	158.2	159.0	0.8
O	9,067	12	101	5.7	163.1	163.0	163.4	0.4
P	9,743	45	241	3.0	163.9	163.8	164.5	0.7
Q	9,973	55	237	3.6	164.0	163.9	164.8	0.9
R	10,291	95	351	2.6	164.3	164.3	165.3	1.0
S	10,853	102	465	1.8	164.8	164.8	165.7	0.9
T	11,409	28	111	4.9	168.1	168.1	168.2	0.1
U	11,586	79	342	2.5	169.8	169.8	170.8	1.0
V	12,375	60	168	5.1	171.7	171.5	172.1	0.6
W	12,715	50	153	4.0	172.9	173.0	173.8	0.8
X	12,955	44	150	4.4	173.7	173.7	174.7	1.0
Y	13,426	75	183	3.8	176.0	176.0	176.4	0.4
Z	14,649	42	153	2.1	181.0	181.0	181.4	0.4
AA	15,630	80	226	2.4	182.6	182.5	183.6	1.1
AB	16,130	70	163	2.6	183.9	184.0	184.7	0.7

[1]Feet above confluence with Rock Creek North

[2]Elevations computed without consideration of backwater effects from Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

DAWSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
DEER CREEK								
A	319	15	38	2.2	175.7	175.7	175.9	0.2
B	592	15	27	3.0	176.1	176.1	176.4	0.3
C	864	10	13	6.1	176.3	176.3	176.4	0.1
D	1,298	13	26	3.1	178.4	178.4	179.2	0.8
E	1,520	14	22	3.6	179.7	179.7	179.8	0.1
F	2,377	9	19	4.2	187.7	187.7	187.7	0.0
G	2,741	7	11	7.3	192.0	192.0	192.1	0.1
H	3,185	9	17	4.8	197.6	197.6	198.0	0.4
I	3,439	8	12	7.0	202.2	202.2	202.2	0.0

[1]Feet above confluence with Bethany Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

DEER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ERICKSON CREEK								
A	379	34	122	4.3	172.6	168.9[2]	169.4[2]	0.5
B	680	27	91	5.3	172.6	170.4[2]	170.7[2]	0.3
C	1,023	17	90	4.4	172.6	172.0[2]	172.5[2]	0.5
D	1,412	28	209	1.9	173.3	173.3	174.0	0.7
E	1,626	26	156	2.8	173.4	173.4	174.2	0.8
F	1,874	67	235	2.2	173.7	173.7	174.4	0.7
G	2,270	31	69	2.7	177.8	177.8	178.3	0.5
H	2,527	40	35	5.4	181.9	181.9	182.4	0.5
I	2,773	40	148	1.3	182.2	182.2	183.0	0.8
J	3,346	24	46	4.1	187.7	187.7	187.7	0.0
K	3,799	41	35	5.4	188.6	188.6	189.1	0.5
L	4,289	39	58	3.2	189.6	189.6	190.2	0.6
M	4,658	35	96	2.0	190.8	190.8	191.0	0.2
N	5,009	21	143	1.5	190.8	190.8	191.1	0.3
O	5,297	19	67	3.1	190.8	190.8	191.2	0.4
P	5,650	10	18	1.3	194.1	194.1	194.8	0.7
Q	5,914	9	22	1.0	194.5	194.5	195.5	1.0
R	6,215	5	18	1.7	197.3	197.3	198.0	0.7
S	6,452	7	10	5.9	198.0	198.0	198.9	0.9
T	6,781	34	204	0.8	198.9	198.9	199.9	1.0
U	6,897	33	178	1.0	198.9	198.9	199.9	1.0
V	7,086	52	220	0.7	199.0	199.0	200.0	1.0
W	7,410	39	155	1.0	199.1	199.1	200.0	0.9
X	7,617	40	147	1.2	199.2	199.2	200.1	0.9
Y	7,993	24	74	1.8	199.6	199.6	200.3	0.7
Z	8,330	15	41	3.9	200.2	200.2	200.8	0.6
AA	8,637	16	32	4.3	202.8	202.8	202.8	0.0

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ERICKSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
FANNO CREEK								
A	0.02	251	2,242	1.9	130.8	120.8[2]	121.8[2]	1.0
B	0.20	351	2,723	1.6	130.8	121.4[2]	122.3[2]	0.9
C	0.53	411	2,308	1.8	130.8	122.2[2]	123.2[2]	1.0
D	0.99	221	1,218	3.5	130.8	126.7[2]	127.6[2]	0.9
E	1.30	126	987	4.2	131.3	131.3	132.0	0.7
F	1.45	98	901	4.7	133.2	133.2	134.2	1.0
G	1.76	271	2,285	1.8	135.2	135.2	136.1	0.9
H	2.25	281	1,770	2.4	136.6	136.6	137.6	1.0
I	2.73	191	793	5.2	141.0	141.0	141.4	0.4
J	3.02	301	2,048	2.0	142.2	142.2	142.7	0.5
K	3.43	311	2,417	1.7	143.8	143.8	144.7	0.9
L	3.80	301	876	4.7	145.3	145.3	146.2	0.9
M	4.08	256	1,206	3.4	147.8	147.8	148.5	0.7
N	4.41	410	1,825	2.2	149.4	149.4	150.0	0.6
O	4.91	161	789	5.1	155.9	155.9	156.8	0.9
P	5.16	256	2,707	1.5	158.6	158.6	159.4	0.8
Q	5.73	331	2,447	1.6	159.5	159.5	160.3	0.8
R	5.99	201	1,998	1.9	161.6	161.6	162.2	0.6
S	6.25	191	1,649	2.0	162.3	162.3	163.2	0.9
T	6.40	191	992	3.3	163.2	163.2	163.9	0.7
U	6.66	226	1,420	1.9	163.9	163.9	164.8	0.9
V	7.11	226	1,280	2.1	165.7	165.7	166.7	1.0
W	7.48	321	1,718	1.6	169.0	169.0	169.3	0.3
X	7.75	331	1,570	1.5	169.5	169.5	170.0	0.5
Y	8.11	601	1,877	1.3	170.6	170.6	171.1	0.5
Z	8.29	351	1,120	2.1	171.8	171.8	172.7	0.9

[1]Miles above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

FANNO CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
FANNO CREEK								
AA	8.67	206	1,364	1.6	180.7	180.7	181.0	0.3
AB	8.91	95	605	3.7	182.1	182.1	182.5	0.4
AC	9.42	311	1,194	1.9	186.1	186.1	186.6	0.5
AD	9.55	96	529	4.2	189.0	189.0	189.7	0.7
AE	9.97	146	1,490	1.4	192.2	192.2	193.2	1.0
AF	10.17	141	806	2.5	194.1	194.1	194.8	0.7
AG	10.62	76	549	3.6	198.0	198.0	199.0	1.0
AH	10.76	176	871	2.3	201.0	201.0	201.8	0.8
AI	11.03	151	1,234	1.6	204.0	204.0	204.8	0.8
AJ	11.38	190	493	4.0	207.8	207.8	208.3	0.5
AK	11.58	176	425	4.5	210.7	210.7	211.3	0.6
AL	11.87	206	532	3.6	214.4	214.4	215.4	1.0
AM	12.18	141	315	5.9	220.0	220.0	220.3	0.3
AN	12.36	236	863	1.8	221.1	221.1	222.1	1.0
AO	12.81	96	346	3.7	230.8	230.8	231.8	1.0
AP	13.16	91	498	2.6	236.4	236.4	237.4	1.0
AQ	13.32	76	360	3.5	239.1	239.1	239.8	0.7
AR	13.49	80	416	3.1	240.3	240.3	241.3	1.0

[1]Miles above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

FANNO CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GALES CREEK								
A	0.80	2,000	4,233	2.4	167.3	162.3[2]	163.2[2]	0.9
B	1.49	1,500	3,744	2.7	167.7	167.7	168.5	0.8
C	1.64	900	6,145	1.6	169.4	169.4	170.3	0.9
D	1.88	1,620	8,828	1.1	171.8	171.8	172.5	0.7
E	2.03	1,590	7,884	1.3	172.3	172.3	173.1	0.8
F	2.39	1,300	9,133	1.1	175.0	175.0	175.5	0.5
G	2.52	1,212	8,651	1.2	175.4	175.4	176.0	0.6
H	2.98	1,950	11,580	0.9	175.6	175.6	176.3	0.7
I	3.35	2,000	7,884	1.3	175.8	175.8	176.5	0.7
J	4.18	410	1,199	8.3	178.5	178.5	179.3	0.8
K	4.28	180	1,951	5.1	182.7	182.7	182.9	0.2
L	4.38	350	2,727	3.6	183.6	183.6	183.9	0.3
M	4.98	2,120	9,893	1.0	184.9	184.9	185.9	1.0
N	5.20	2,450	7,252	1.4	185.2	185.2	186.2	1.0
O	5.68	2,370	5,147	1.9	186.8	186.8	187.7	0.9
P	6.13	1,900	5,113	1.9	189.4	189.4	189.9	0.5
Q	6.51	1,600	3,240	3.0	191.4	191.4	192.4	1.0
R	6.93	1,260	3,861	2.5	196.8	196.8	197.8	1.0
S	7.16	660	4,170	2.3	198.8	198.8	199.5	0.7
T	7.55	570	2,044	4.8	201.2	201.2	202.0	0.8
U	7.92	190	1,826	5.2	205.5	205.5	206.4	0.9
V	7.98	225	2,229	4.2	207.0	207.0	207.6	0.6
W	8.06	470	3,750	2.5	207.3	207.3	208.3	1.0
X	8.42	350	3,469	2.7	208.9	208.9	209.8	0.9
Y	8.72	210	2,188	4.3	211.3	211.3	211.9	0.6
Z	8.98	350	2,632	3.6	214.4	214.4	215.1	0.7

[1]Miles above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

GALES CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GALES CREEK								
AA	9.48	350	3,515	2.7	219.0	219.0	219.9	0.9
AB	9.58	90	1,215	7.5	219.8	219.8	220.5	0.7
AC	17.38	81	739	7.6	464.4	464.4	465.4	1.0
AD	17.72	75	631	8.9	477.1	477.1	477.7	0.6
AE	17.89	88	841	6.6	483.3	483.3	483.5	0.2
AF	17.97	60	383	14.5	486.6	486.6	486.6	0.0
AG	18.28	67	703	6.0	504.2	504.2	504.2	0.0

[1]Miles above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

GALES CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GLENCOE SWALE								
A	1,011	119	351	2.0	156.2	140.5[2]	141.5[2]	1.0
B	1,511	61	143	3.7	156.2	141.3[2]	142.1[2]	0.8
C	2,038	40	125	3.8	156.2	143.0[2]	143.7[2]	0.7
D	2,647	22	104	3.6	156.2	144.5[2]	145.3[2]	0.8
E	3,158	22	79	5.1	156.2	146.5[2]	147.1[2]	0.6
F	3,469	22	144	2.3	159.2	159.2	160.0	0.8
G	4,337	79	973	1.1	159.3	159.3	160.3	1.0
H	4,943	36	615	1.2	166.4	166.4	167.4	1.0
I	5,336	96	1,711	0.4	166.4	166.4	167.4	1.0
J	5,920	91	1,392	0.5	166.4	166.4	167.4	1.0
K	7,051	120	1,522	0.7	166.4	166.4	167.4	1.0
L	7,915	128	1,306	0.8	166.4	166.4	167.4	1.0
M	8,545	143	1,285	0.8	166.4	166.4	167.4	1.0
N	9,149	160	1,148	0.9	166.4	166.4	167.4	1.0
O	9,635	79	490	2.0	166.6	166.6	167.6	1.0
P	10,051	71	411	2.3	166.8	166.8	167.7	0.9
Q	10,548	80	360	3.2	167.2	167.2	168.0	0.8
R	10,653	25	245	3.7	172.6	172.6	173.0	0.4
S	11,112	96	709	1.3	172.6	172.6	173.4	0.8
T	11,598	54	271	2.6	172.7	172.7	173.5	0.8
U	12,055	109	344	2.5	173.2	173.2	173.8	0.6
V	12,680	48	91	5.1	173.3	173.3	173.7	0.4
W	13,235	39	179	2.6	175.6	175.6	175.9	0.3
X	13,733	25	66	11.2	177.4	177.4	177.4	0.0
Y	14,329	67	305	2.4	183.7	183.7	184.3	0.6
Z	15,222	79	311	1.6	183.9	183.9	184.6	0.7

[1]Feet above confluence with McKay Creek

[2]Elevations computed without consideration of backwater effects from McKay Creek and Dairy Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

GLENCOE SWALE

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GLENCOE SWALE								
AA	15,713	73	301	1.5	187.3	187.3	187.5	0.2
AB	16,182	42	178	2.4	187.3	187.3	187.6	0.3
AC	16,700	58	216	2.0	187.4	187.4	187.9	0.5
AD	17,233	36	74	4.7	188.0	188.0	188.7	0.7
AE	18,004	42	283	1.0	194.6	194.6	195.5	0.9
AF	18,713	97	361	1.0	194.6	194.6	195.6	1.0
AG	18,924	88	297	0.5	194.6	194.7	195.6	0.9
AH	19,541	28	60	2.3	194.7	194.7	195.7	1.0
AI	20,023	16	35	3.6	197.0	197.0	197.0	0.0
AJ	20,496	18	35	3.1	198.8	198.8	199.4	0.6
AK	20,981	23	55	2.1	199.9	199.9	200.8	0.9
AL	21,477	22	49	2.3	200.9	200.9	201.8	0.9

[1]Feet above confluence with McKay Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

GLENCOE SWALE

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GOLF CREEK								
A	338	80	225	1.6	198.3	198.3	199.3	1.0
B	713	26	112	3.9	199.8	199.8	200.7	0.9
C	950	31	103	4.1	200.9	200.9	201.6	0.7
D	1,092	62	281	1.5	202.6	202.6	203.6	1.0
E	1,226	35	125	3.5	202.8	202.8	203.7	0.9
F	1,330	29	117	3.2	203.0	203.0	204.0	1.0
G	1,436	10	49	8.6	203.3	203.3	204.0	0.7
H	1,639	29	162	2.6	210.1	210.1	210.9	0.8
I	2,028	21	160	2.6	213.9	213.9	214.8	0.9
J	2,094	60	415	1.0	214.0	214.0	214.9	1.0
K	2,280	34	217	1.9	214.0	214.0	214.9	0.9
L	2,448	34	182	2.1	214.0	214.0	215.0	1.0
M	2,663	66	341	1.2	214.2	214.2	215.2	1.0
N	2,819	18	71	5.9	214.2	214.2	215.2	1.0
O	2,967	61	501	1.1	221.6	221.6	222.5	0.9
P	3,224	43	297	1.5	221.7	221.7	222.5	0.8
Q	3,393	55	252	1.7	221.7	221.7	222.6	0.9
R	3,576	18	72	5.0	223.1	223.1	223.4	0.3

[1]Feet above confluence with Hall Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
GORDON CREEK								
A	521	8	22	9.5	146.2	128.4[2]	128.5[2]	0.1
B	1,817	25	80	2.6	146.2	136.0[2]	136.7[2]	0.7
C	2,497	17	27	7.1	146.2	141.1[2]	141.1[2]	0.0
D	3,358	32	92	2.5	152.9	152.9	153.6	0.7
E	3,913	20	96	2.0	153.0	153.0	153.9	0.9
F	4,822	16	36	5.3	154.3	154.3	154.7	0.4
G	5,383	19	61	3.8	160.2	160.2	160.4	0.2
H	5,898	45	93	1.8	160.7	160.7	161.4	0.7
I	6,178	30	26	3.6	161.8	161.8	161.8	0.0
J	6,732	19	29	2.7	165.4	165.4	165.5	0.1
K	6,818	12	42	1.8	168.6	168.6	168.6	0.0
L	7,653	13	14	6.6	172.9	172.9	172.9	0.0
M	8,514	9	21	3.3	181.7	181.7	182.6	0.9
N	8,595	12	38	1.5	182.7	182.7	183.5	0.8
O	9,360	17	6	3.5	191.6	191.6	191.6	0.0
P	9,990	23	13	1.2	196.3	196.3	196.3	0.0

[1]Feet above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

GORDON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HALL CREEK								
A	319	48	423	2.4	181.1	181.0	181.2	0.2
B	641	31	264	2.8	181.1	181.1	181.2	0.1
C	846	58	163	3.1	181.7	181.7	182.7	1.0
D	1,184	116	304	1.6	182.1	182.1	183.1	1.0
E	1,546	44	264	2.8	182.9	182.9	183.8	0.9
F	1,906	93	725	1.0	183.8	183.8	184.8	1.0
G	2,024	73	427	1.8	183.9	183.9	184.9	1.0
H	2,256	88	518	1.5	184.4	184.4	185.3	0.9
I	2,491	64	352	2.1	184.6	184.6	185.4	0.8
J	2,654	37	201	3.7	185.4	185.4	186.0	0.6
K	2,807	226	627	1.3	185.8	185.8	186.3	0.5
L	3,303	47	269	2.7	190.0	190.0	190.0	0.0
M	3,747	15	137	5.0	191.3	191.3	191.8	0.5
N	3,929	26	147	4.6	192.2	192.2	192.6	0.4
O	4,133	24	168	4.0	193.4	193.4	194.3	0.9
P	4,339	73	298	2.1	194.5	194.5	195.4	0.9
Q	4,603	71	389	1.9	195.1	195.1	195.9	0.8
R	4,909	25	131	5.4	198.0	198.0	198.2	0.2
S	5,264	126	552	0.5	198.4	198.4	199.4	1.0
T	5,551	126	469	0.6	198.4	198.4	199.4	1.0
U	5,864	103	438	0.7	198.3	198.3	199.4	0.9
V	6,148	13	51	4.9	198.5	198.5	199.4	0.9
W	6,253	23	122	2.2	201.7	201.7	202.7	1.0
X	6,572	49	235	1.1	202.0	202.0	202.9	0.9
Y	6,883	23	71	3.6	202.1	202.1	203.1	1.0
Z	7,157	26	68	3.7	205.2	205.2	205.2	0.0

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

HALL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HALL CREEK								
AA	7,308	26	60	5.2	206.8	206.8	207.0	0.2
AB	7,542	36	29	5.1	207.8	207.8	208.0	0.2
AC	7,784	23	94	1.1	210.4	210.4	210.5	0.1
AD	8,001	10	54	3.1	210.4	210.4	210.7	0.3
AE	8,196	13	46	3.9	210.7	210.7	211.6	0.9
AF	8,325	14	42	4.0	213.4	213.4	213.6	0.2
AG	8,514	18	103	1.6	219.6	219.6	220.6	1.0
AH	8,644	21	91	1.8	219.7	219.7	220.7	1.0
AI	8,749	39	131	1.1	219.8	219.8	220.8	1.0
AJ	8,921	22	61	2.7	220.1	220.1	220.9	0.8
AK	9,111	15	30	5.0	222.0	222.0	222.0	0.0
AL	9,295	55	231	0.7	227.3	227.3	228.1	0.8
AM	9,536	19	38	4.3	227.3	227.3	228.0	0.7
AN	9,846	13	35	5.3	231.9	231.9	231.9	0.0
AO	9,966	9	32	5.2	235.8	235.8	236.2	0.4
AP	10,091	15	45	3.9	236.1	236.1	237.0	0.9
AQ	10,306	10	40	3.6	238.0	238.0	238.3	0.3
AR	10,448	36	150	0.9	243.0	243.0	243.9	0.9
AS	10,681	21	64	2.4	243.0	243.0	244.0	1.0
AT	10,842	18	45	3.5	244.4	244.4	244.7	0.3
AU	10,952	11	34	4.3	245.4	245.4	245.8	0.4
AV	11,073	253	1,274	0.1	250.4	250.4	251.1	0.7
AW	11,228	314	1,569	0.1	250.4	250.4	251.1	0.7
AX	11,326	58	90	0.8	250.4	250.4	251.1	0.7
AY	11,434	102	195	1.3	255.4	255.4	256.1	0.7
AZ	11,558	13	84	1.7	255.5	255.5	256.2	0.7

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

HALL CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HALL CREEK - 106TH TRIBUTARY								
A	138	10	5	4.0	191.6	191.6	191.8	0.2
B	449	10	5	4.0	195.2	195.2	195.4	0.2
C	616	10	5	3.9	200.3	200.3	200.5	0.2
D	766	10	5	4.0	205.2	205.2	205.2	0.0
E	912	10	5	4.0	208.4	208.4	208.4	0.0
F	1,215	7	27	2.6	209.7	209.7	209.9	0.2
G	1,357	10	20	1.7	209.9	209.9	210.4	0.5
H	1,507	14	12	2.9	211.9	211.9	211.9	0.0
I	1,812	7	4	8.0	218.5	218.5	218.5	0.0
J	2,162	22	43	0.8	226.1	226.1	226.2	0.1
K	2,372	10	12	2.7	231.0	231.0	231.3	0.3
L	2,436	5	17	2.0	231.1	231.1	231.4	0.3
M	2,647	10	19	1.8	231.7	231.7	232.1	0.4
N	2,937	3	5	6.9	245.1	245.1	245.1	0.0

[1]Feet above confluence with Hall Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HALL CREEK - NORTH FORK								
A	182	9	16	3.2	181.1	181.1	181.2	0.1
B	475	30	18	2.7	181.1	181.1	181.4	0.3
C	553	30	78	0.6	182.3	182.3	182.4	0.1
D	668	24	220	1.1	182.4	182.4	182.4	0.0
E	804	13	135	1.9	182.4	182.4	182.4	0.0
F	1,224	39	300	0.8	182.5	182.5	182.7	0.2
G	1,428	10	98	2.4	182.5	182.5	182.7	0.2
H	1,576	10	103	2.2	182.5	182.5	183.0	0.5
I	1,699	18	166	1.5	182.5	182.5	183.2	0.7
J	2,005	30	209	1.4	182.5	182.5	183.3	0.8
K	2,101	37	256	1.1	182.5	182.5	183.4	0.9
L	2,245	32	244	1.0	182.5	182.5	183.4	0.9
M	2,382	43	258	0.9	182.6	182.6	183.4	0.8
N	2,739	54	328	0.8	182.6	182.6	183.5	0.9
O	3,056	61	231	0.9	182.6	182.6	183.5	0.9
P	3,245	62	178	1.3	182.6	182.6	183.6	1.0

[1]Feet above confluence with Hall Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

HALL CREEK - NORTH FORK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HALL CREEK - SOUTH FORK								
A	147	27	12	3.9	212.4	212.4	212.4	0.0
B	378	23	11	4.0	218.1	218.1	218.1	0.0
C	612	8	22	3.4	218.3	218.3	218.5	0.2
D	902	30	87	0.9	220.7	220.7	221.0	0.3
E	1,017	40	56	0.8	221.2	221.2	221.3	0.1
F	1,161	15	17	2.6	224.2	224.2	224.2	0.0
G	1,365	42	42	1.0	227.7	227.7	227.8	0.1
H	1,764	10	16	2.7	231.3	231.3	231.9	0.6
I	2,088	10	15	2.8	235.1	235.1	235.9	0.8
J	2,434	30	8	3.0	239.5	239.5	239.6	0.1
K	2,621	27	52	0.5	241.1	241.1	241.2	0.1
L	2,747	7	25	2.1	241.8	241.8	242.6	0.8
M	2,852	12	36	1.2	241.9	241.9	242.8	0.9
N	2,999	7	7	5.9	243.1	243.1	243.1	0.0
O	3,121	17	35	1.2	245.9	245.9	246.6	0.7
P	3,258	15	42	1.0	247.9	247.9	248.7	0.8
Q	3,374	22	16	1.4	249.7	249.7	250.1	0.4
R	3,534	13	6	3.9	252.1	252.0	252.0	0.0
S	3,580	22	14	1.7	253.1	253.1	253.1	0.0
T	3,836	5	4	7.2	258.1	258.1	258.1	0.0
U	3,990	10	9	3.5	259.8	259.8	259.8	0.0
V	4,035	22	68	0.4	260.1	260.1	260.1	0.0

[1]Feet above confluence with Hall Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

HALL CREEK - SOUTH FORK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HEDGES CREEK								
A	823	40	359	1.7	128.9	122.1[2]	123.0[2]	0.9
B	1,384	72	474	1.5	128.9	122.4[2]	123.3[2]	0.9
C	1,442	78	555	0.9	128.9	122.4[2]	123.3[2]	0.9
D	1,895	141	823	0.6	128.9	122.4[2]	123.3[2]	0.9
E	1,998	177	1,017	0.3	128.9	122.4[2]	123.4[2]	1.0
F	2,137	190	1,066	0.3	128.9	122.4[2]	123.4[2]	1.0
G	2,330	188	1,391	0.5	128.9	125.1[2]	125.9[2]	0.8
H	2,642	205	1,547	0.6	128.9	125.1[2]	125.9[2]	0.8
I	3,164	117	753	1.7	128.9	125.1[2]	126.0[2]	0.9
J	3,267	215	1,171	0.9	128.9	125.2[2]	126.0[2]	0.8
K	4,288	188	1,122	1.0	128.9	125.7[2]	126.2[2]	0.5
L	4,664	117	562	1.8	128.9	126.7[2]	127.1[2]	0.4
M	5,002	116	623	1.4	128.9	126.9[2]	127.3[2]	0.4
N	5,577	84	359	2.9	128.9	127.4[2]	127.8[2]	0.4
O	6,148	87	530	1.7	128.9	127.8[2]	128.5[2]	0.7
P	6,681	76	597	2.0	128.9	128.1[2]	128.9[2]	0.8
Q	7,162	66	252	3.5	129.3	129.3	129.7	0.4
R	7,699	27	152	6.3	133.1	133.1	133.2	0.1
S	7,918	136	770	1.3	133.9	133.9	134.4	0.5
T	8,365	171	1,202	0.8	133.9	133.9	134.5	0.6
U	8,742	72	495	1.6	133.9	133.9	134.5	0.6
V	9,353	74	418	1.9	134.4	134.4	134.9	0.5
W	9,554	61	348	2.3	134.6	134.6	135.1	0.5
X	10,016	50	133	6.0	136.1	136.1	136.2	0.1
Y	10,959	36	294	2.8	139.9	139.9	140.4	0.5
Z	11,919	32	143	5.2	142.1	142.1	142.8	0.7

[1]Feet above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
HOLCOMB CREEK								
A	207	71	222	2.9	178.3	175.3[2]	176.2[2]	0.9
B	800	203	885	0.6	178.3	175.5[2]	176.4[2]	0.9
C	1,476	132	632	0.7	178.3	175.5[2]	176.5[2]	1.0
D	2,453	64	139	5.2	178.3	177.7[2]	178.3[2]	0.6
E	2,817	68	193	2.6	178.3	178.2[2]	179.2[2]	1.0
F	3,105	68	180	3.1	178.7	178.7	179.7	1.0
G	3,653	59	155	3.6	180.2	180.2	181.1	0.9
H	4,537	48	295	2.7	185.9	185.9	186.8	0.9
I	5,445	78	205	2.5	186.0	186.0	187.0	1.0
J	6,416	98	141	3.3	189.5	189.5	190.1	0.6
K	7,335	81	148	2.3	192.9	192.9	193.8	0.9
L	8,277	252	91	4.5	198.1	198.1	199.2	1.1
M	8,664	307	101	2.7	199.9	199.9	200.8	0.9
N	9,176	262	78	4.0	203.1	203.1	204.1	1.0
O	9,724	75	65	5.7	207.2	207.2	208.1	0.9
P	10,539	19	85	3.7	211.5	211.5	211.8	0.3

[1]Feet above confluence with Rock Creek North

[2]Elevations computed without consideration of backwater effects from Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

HOLCOMB CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
McKAY CREEK								
A	2,402	904	4,578	3.2	156.2	144.0[2]	144.4[2]	0.4
B	5,424	904	5,385	2.9	156.2	144.9[2]	145.6[2]	0.7
C	6,713	755	4,047	3.6	156.2	145.5[2]	146.5[2]	1.0
D	7,267	174	1,674	4.7	156.2	146.6[2]	147.5[2]	0.9
E	8,284	324	2,321	4.8	156.2	148.3[2]	149.1[2]	0.8
F	9,134	285	2,552	4.8	156.2	149.2[2]	150.2[2]	1.0
G	12,500	120	1,318	7.3	156.2	152.6[2]	153.1[2]	0.5
H	12,932	514	6,106	1.7	156.2	153.9[2]	154.8[2]	0.9
I	13,841	643	7,219	1.6	156.2	154.0[2]	154.9[2]	0.9
J	14,898	635	6,836	1.8	156.2	154.1[2]	155.0[2]	0.9
K	17,641	686	5,548	2.7	156.2	154.7[2]	155.5[2]	0.8
L	20,386	307	3,335	3.4	156.4	156.4	157.1	0.7
M	21,680	480	4,812	2.4	156.9	156.9	157.6	0.7
N	23,639	652	6,149	1.9	157.4	157.4	158.0	0.6
O	24,798	635	5,002	2.2	158.7	158.7	159.4	0.7
P	29,941	362	3,400	2.9	160.0	160.0	160.8	0.8
Q	33,869	465	3,999	2.2	161.4	161.4	162.2	0.8
R	35,617	202	2,466	3.4	161.9	161.9	162.8	0.9
S	35,775	96	1,175	4.7	162.0	162.0	163.0	1.0
T	35,822	119	1,381	4.7	162.4	162.4	163.2	0.8
U	37,420	338	3,128	2.7	163.5	163.5	164.4	0.9
V	38,688	531	4,696	1.9	164.0	164.0	164.8	0.8
W	45,547	106	1,071	5.0	167.5	167.5	168.4	0.9
X	45,679	83	1,002	5.4	168.5	168.5	169.2	0.7
Y	46,698	390	3,322	2.3	169.9	169.9	170.6	0.7
Z	48,055	95	808	7.9	170.4	170.4	171.3	0.9

[1]Feet above confluence with Dairy Creek

[2]Elevations computed without consideration of backwater effects from Dairy Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

McKAY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
McKAY CREEK								
AA	49,626	405	3,798	1.9	172.5	172.5	173.2	0.7
AB	52,091	409	3,146	2.7	172.9	172.9	173.6	0.7
AC	53,646	415	3,427	2.2	173.3	173.3	174.1	0.8
AD	54,233	105	972	4.7	173.6	173.6	174.4	0.8
AE	54,337	223	2,103	3.5	174.5	174.5	175.1	0.6

[1]Feet above confluence with Dairy Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

McKAY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
NORTH JOHNSON CREEK								
A	112	45	222	2.4	187.0	187.0	187.0	0.0
B	534	14	119	4.4	187.5	187.5	187.7	0.2
C	680	24	189	2.8	187.9	187.9	188.1	0.2
D	898	26	196	2.7	188.2	188.2	188.4	0.2
E	1,198	41	170	3.9	188.6	188.6	188.8	0.2
F	1,680	36	197	2.7	189.4	189.4	189.6	0.2
G	2,152	27	180	2.9	189.9	189.9	190.2	0.3
H	3,041	189	1,284	0.3	190.1	190.1	190.7	0.6
I	3,280	204	1,524	0.1	190.1	190.1	190.7	0.6
J	3,884	233	1,230	0.2	190.1	190.1	190.7	0.6
K	4,609	32	129	3.0	190.7	190.7	191.1	0.4
L	4,796	20	176	2.6	196.3	196.3	197.0	0.7
M	4,942	34	272	1.6	196.3	196.3	197.2	0.9
N	5,334	35	235	1.8	196.4	196.4	197.3	0.9
O	5,747	57	232	1.8	196.4	196.4	197.4	1.0
P	6,259	167	264	1.9	198.0	198.0	198.6	0.6
Q	6,560	8	32	11.4	201.7	201.7	201.7	0.0
R	6,814	8	64	5.8	206.4	206.4	206.4	0.0
S	6,913	13	119	3.1	207.1	207.1	207.1	0.0
T	7,393	41	234	1.4	207.1	207.1	207.7	0.6
U	7,911	49	307	1.4	208.2	208.2	208.9	0.7
V	8,465	193	134	5.5	209.8	209.8	210.4	0.6
W	9,065	110	92	4.4	212.4	212.4	212.7	0.3
X	9,269	152	143	2.2	214.6	214.6	214.6	0.0
Y	10,057	40	79	4.9	218.9	218.9	219.6	0.7
Z	10,520	15	254	1.2	237.0	237.0	237.0	0.0

[1]Feet above confluence with Cedar Mill Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

NORTH JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
NORTH JOHNSON CREEK								
AA	10,929	73	465	0.7	237.1	237.1	237.1	0.0
AB	11,252	29	76	4.0	237.6	237.6	237.8	0.2
AC	11,657	110	181	1.7	242.1	242.1	242.1	0.0
AD	12,030	60	90	3.5	245.9	245.9	245.9	0.0
AE	12,426	110	165	1.9	249.4	249.4	249.4	0.0
AF	12,613	42	88	3.9	250.7	250.7	250.9	0.2
AG	12,996	30	84	4.0	254.4	254.4	255.0	0.6
AH	13,320	21	47	5.5	259.6	259.6	259.8	0.2
AI	13,770	15	39	7.1	276.4	276.4	277.0	0.6
AJ	14,136	14	26	6.0	293.6	293.6	293.7	0.1
AK	14,419	23	30	4.6	306.9	306.9	307.2	0.3

[1]Feet above confluence with Cedar Mill Creek

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
NORTH JOHNSON EAST TRIBUTARY								
A	376	32	15	3.9	252.0	252.0	252.0	0.0
B	619	8	29	2.0	254.5	254.5	255.3	0.8
C	921	9	10	5.9	258.8	258.8	258.8	0.0
D	1,224	16	15	3.8	281.1	281.1	281.1	0.0
E	1,505	20	21	2.8	290.4	290.4	290.4	0.0
F	1,909	9	10	5.9	327.1	327.1	327.1	0.0
NORTH JOHNSON NORTH TRIBUTARY								
A	544	61	31	4.1	222.0	222.0	222.0	0.0
B	873	37	50	3.0	229.9	229.9	230.0	0.1
C	1,165	8	37	3.5	237.3	237.3	237.4	0.1
D	1,338	15	62	2.4	242.7	242.7	242.7	0.0
E	1,576	15	19	6.6	252.0	252.0	252.0	0.0
F	1,803	21	57	2.2	255.8	255.8	255.8	0.0
G	1,981	10	17	7.5	262.5	262.5	262.5	0.0
H	2,089	4	31	4.1	270.9	270.9	270.9	0.0
I	2,603	24	22	6.3	290.2	290.2	290.2	0.0
J	3,157	7	13	7.8	343.3	343.3	343.3	0.0

[1]Feet above confluence with North Johnson Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

NORTH JOHNSON CREEK - EAST AND NORTH TRIBUTARIES

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH [2] (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
NYBERG SLOUGH								
A	643	504	6,898	0.4	126.0	126.0	126.2	0.2
B	755	559	6,993	0.3	126.0	126.0	126.3	0.3
C	994	403	5,518	0.5	126.0	126.0	126.3	0.3
D	1,593	146	1,306	3.6	126.0	126.0	126.2	0.2
E	1,744	109	1,593	2.5	126.6	126.6	126.9	0.3
F	2,193	349	5,407	0.3	126.6	126.6	127.0	0.4
G	2,926	349	5,097	0.8	126.6	126.6	127.0	0.4
H	3,550	393	5,605	0.5	126.6	126.6	127.0	0.4
I	3,938	90	768	5.7	126.6	126.6	126.9	0.3
J	4,219	131	1,614	4.3	127.9	127.9	128.1	0.2
K[2]	5,081	226	2,108	1.0	127.9	127.9	128.2	0.3

[1] Feet above confluence with Tualatin River

[2] Floodway does not exist upstream of cross section K

This table shows the Nyberg Slough in Clakamas County and Washington County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

KING COUNTY, WA

AND INCORPORATED AREAS

FLOODWAY DATA

NYBERG SLOUGH (IN WASHINGTON COUNTY AND CLAKAMAS COUNTY)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK NORTH								
A	1,801	264	2,586	4.1	147.0	135.0[2]	136.0[2]	1.0
B	2,680	205	2,542	4.9	147.0	136.0[2]	136.8[2]	0.8
C	3,167	194	2,130	6.1	147.0	136.7[2]	137.5[2]	0.8
D	3,652	182	2,192	6.1	147.0	137.1[2]	138.1[2]	1.0
E	4,131	130	1,674	5.6	147.0	137.6[2]	138.7[2]	1.1
F	4,854	196	2,562	4.0	147.0	139.5[2]	140.3[2]	0.8
G	6,139	199	2,667	3.5	147.0	140.3[2]	141.2[2]	0.9
H	7,342	158	2,131	5.1	147.0	141.0[2]	141.9[2]	0.9
I	7,860	169	2,359	4.8	147.0	142.0[2]	142.7[2]	0.7
J	8,444	228	3,025	4.2	147.0	142.1[2]	143.1[2]	1.0
K	9,629	324	4,237	2.7	147.0	142.5[2]	143.5[2]	1.0
L	12,191	278	3,626	2.8	147.0	143.0[2]	143.9[2]	0.9
M	12,943	237	2,933	4.4	147.0	143.1[2]	144.1[2]	1.0
N	13,574	290	3,527	3.5	147.0	143.4[2]	144.4[2]	1.0
O	14,222	290	3,461	3.8	147.0	143.6[2]	144.6[2]	1.0
P	15,554	342	4,275	2.9	147.0	144.0[2]	144.9[2]	0.9
Q	16,515	294	3,401	3.6	147.0	144.2[2]	145.1[2]	0.9
R	16,792	159	2,205	5.3	147.0	145.2[2]	145.7[2]	0.5
S	17,307	285	3,609	3.4	147.0	145.6[2]	146.1[2]	0.5
T	18,596	337	3,940	3.3	147.0	145.9[2]	146.3[2]	0.4
U	19,348	289	2,883	4.4	147.0	146.1[2]	146.6[2]	0.5
V	19,960	354	3,664	3.4	147.0	146.4[2]	146.9[2]	0.5
W	20,736	299	3,177	3.8	147.0	146.7[2]	147.2[2]	0.5
X	21,420	279	3,249	2.9	147.0	146.8[2]	147.4[2]	0.6
Y	22,301	332	3,667	2.8	147.0	147.0	147.7	0.7
Z	23,050	475	4,709	3.0	147.2	147.2	147.9	0.7

[1]Feet above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK NORTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK NORTH								
AA	24,285	510	4,185	3.2	147.3	147.3	148.1	0.8
AB	25,237	322	3,422	3.5	147.7	147.7	148.5	0.8
AC	25,901	314	3,101	4.0	147.9	147.9	148.7	0.8
AD	26,555	262	2,960	3.9	148.3	148.3	148.9	0.6
AE	27,322	333	3,492	3.5	148.6	148.6	149.2	0.6
AF	27,982	319	3,051	3.2	148.8	148.8	149.6	0.8
AG	28,569	311	3,369	2.6	149.2	149.2	149.9	0.7
AH	29,231	316	3,521	2.7	149.3	149.3	150.1	0.8
AI	30,496	182	1,957	1.7	150.2	150.2	151.1	0.9
AJ	31,289	187	1,771	1.6	150.3	150.3	151.2	0.9
AK	32,472	140	1,207	2.4	150.6	150.6	151.4	0.8
AL	32,569	86	781	3.4	150.8	150.8	151.5	0.7
AM	33,632	217	1,697	1.4	151.2	151.2	151.9	0.7
AN	34,811	191	1,220	2.3	151.5	151.5	152.1	0.6
AO	34,933	193	1,229	2.5	151.5	151.5	152.2	0.7
AP	35,540	163	1,107	2.6	151.8	151.8	152.4	0.6
AQ	36,100	81	626	5.0	152.2	152.2	152.8	0.6
AR	36,608	105	876	3.3	152.6	152.6	153.6	1.0
AS	36,845	170	1,181	2.9	152.7	152.7	153.7	1.0
AT	37,890	58	557	4.7	153.3	153.3	154.1	0.8
AU	38,726	121	942	3.5	154.4	154.4	155.1	0.7
AV	39,009	118	967	3.0	154.5	154.5	155.3	0.8
AW	39,491	128	932	3.2	154.9	154.9	155.7	0.8
AX	40,071	138	1,031	2.9	155.3	155.3	156.1	0.8
AY	40,497	150	1,185	2.3	155.5	155.5	156.3	0.8
AZ	41,004	153	949	3.2	155.6	155.6	156.6	1.0

[1]Feet above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK NORTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK NORTH								
BA	41,826	180	1,176	2.5	156.2	156.2	157.2	1.0
BB	42,399	191	1,053	2.8	156.4	156.4	157.4	1.0
BC	43,433	167	968	3.0	157.1	157.1	158.1	1.0
BD	43,494	166	960	3.0	157.1	157.1	158.1	1.0
BE	44,078	127	683	4.2	157.8	157.8	158.6	0.8
BF	44,294	38	404	6.3	158.2	158.2	159.0	0.8
BG	44,929	170	1,098	2.7	159.3	159.3	160.3	1.0
BH	45,210	250	1,608	1.8	159.4	159.4	160.4	1.0
BI	45,511	204	1,381	2.1	160.1	160.1	161.0	0.9
BJ	45,974	192	1,127	2.6	160.2	160.2	161.2	1.0
BK	46,447	172	952	2.7	160.5	160.5	161.5	1.0
BL	46,971	120	686	4.3	161.0	161.0	161.8	0.8
BM	47,734	146	727	4.3	162.2	162.2	162.9	0.7
BN	48,162	250	1,149	2.6	162.7	162.7	163.5	0.8
BO	48,824	200	1,263	2.1	163.2	163.2	163.8	0.6
BP	49,146	300	1,748	1.3	163.9	163.9	164.4	0.5
BQ	49,469	190	622	4.8	164.0	164.0	164.5	0.5
BR	49,684	89	656	4.1	167.5	167.5	168.1	0.6
BS	50,249	111	932	3.1	168.9	168.9	169.4	0.5
BT	50,580	263	1,530	1.8	169.1	169.1	169.6	0.5
BU	50,692	268	1,345	1.8	169.2	169.2	169.9	0.7
BV	51,156	263	1,624	1.3	169.3	169.3	170.0	0.7
BW	51,639	264	1,685	1.2	169.4	169.4	170.1	0.7
BX	52,074	262	1,467	1.5	169.4	169.4	170.2	0.8
BY	52,397	253	1,024	3.1	169.5	169.5	170.3	0.8
BZ	52,907	233	1,042	2.5	169.8	169.8	170.6	0.8

[1]Feet above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK NORTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK NORTH								
CA	53,015	190	882	2.9	170.0	170.0	170.8	0.8
CB	53,916	109	626	4.5	170.6	170.6	171.5	0.9
CC	54,557	77	500	4.8	172.1	172.1	172.6	0.5
CD	54,787	61	383	6.7	172.6	172.6	173.2	0.6
CE	56,122	67	597	3.5	176.3	176.3	177.2	0.9
CF	57,202	110	814	2.9	177.7	177.7	178.4	0.7
CG	57,448	313	2352	1.1	178.2	178.2	179.1	0.9
CH	58,279	335	2384	1.0	178.3	178.3	179.1	0.9
CI	59,447	435	2644	0.9	178.3	178.3	179.2	0.9
CJ	60,194	510	2383	1.3	178.3	178.3	179.3	1.0
CK	61,015	870	3210	0.5	178.4	178.4	179.3	0.9
CL	62,388	593	1303	1.3	178.4	178.4	179.4	1.0
CM	64,142	169	365	5.0	181.4	181.4	181.5	0.1
CN	65,206	82	350	2.6	184.1	184.1	184.3	0.2
CO	65,969	432	1060	1.7	185.5	185.5	186.0	0.5
CP	66,713	702	725	3.6	186.2	186.2	187.2	1.0
CQ	68,130	220	690	2.4	189.1	189.1	190.0	0.9
CR	69,186	87	299	5.8	191.1	191.1	192.0	0.9
CS	69,972	198	526	3.8	194.0	194.0	194.9	0.9
CT	70,736	336	935	1.1	195.0	195.0	195.7	0.7
CU	71,262	26	193	5.5	195.8	195.8	196.4	0.6
CV	72,384	226	527	2.7	198.7	198.7	199.1	0.4
CW	72,943	115	289	4.9	199.7	199.7	200.2	0.5
CX	74,073	186	514	3.0	202.3	202.3	202.8	0.5
CY	75,339	290	463	3.4	204.8	204.8	204.9	0.1
CZ	76,654	105	359	3.5	206.7	206.7	207.3	0.6

[1]Feet above confluence with Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK NORTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK NORTH								
DA	77,165	188	545	2.3	207.1	207.1	208.0	0.9
DB	77,983	32	149	6.3	209.7	209.7	209.7	0.0
DC	79,349	308	512	2.7	213.5	213.5	214.3	0.8
DD	80,907	323	505	2.3	216.1	216.1	216.7	0.6
DE	81,790	188	184	6.4	219.2	219.2	220.0	0.8
DF	83,164	243	500	2.2	223.4	223.4	224.2	0.8
DG	84,509	50	184	4.9	226.7	226.7	226.8	0.1
DH	84,692	39	192	4.0	227.8	227.8	227.9	0.1
DI	86,000	100	204	4.0	230.6	230.6	230.7	0.1
DJ	86,763	26	113	6.5	235.2	235.2	235.2	0.0
DK	87,401	30	81	8.7	237.7	237.7	238.0	0.3
DL	87,916	20	111	6.8	243.9	243.9	243.9	0.0
DM	88,425	16	104	6.5	247.2	247.2	247.4	0.2

[1]Feet above confluence with Tualatin River

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
ROCK CREEK SOUTH								
A	1,478	50	326	2.3	134.3	120.1[2]	120.9[2]	0.8
B	1,985	61	655	0.8	134.3	120.1[2]	121.1[2]	1.0
C	2,473	36	297	2.5	134.3	120.1[2]	121.1[2]	1.0
D	2,688	67	568	1.5	134.3	120.5[2]	121.4[2]	0.9
E	3,583	50	436	1.0	134.3	120.7[2]	121.6[2]	0.9
F	4,716	40	350	1.6	134.3	120.9[2]	121.8[2]	0.9
G	5,036	55	401	1.2	134.3	121.0[2]	121.9[2]	0.9
H	6,297	35	158	3.3	134.3	121.8[2]	122.6[2]	0.8
I	7,030	33	121	3.7	134.3	125.1[2]	125.7[2]	0.6
J	7,710	35	106	4.4	134.3	130.8[2]	130.9[2]	0.1
K	7,917	37	118	3.3	134.3	132.1[2]	132.1[2]	0.0
L	8,242	37	194	2.0	136.3	136.3	136.4	0.1
M	8,907	66	361	1.8	136.9	136.9	137.1	0.2
N	9,096	33	247	3.1	137.8	137.8	138.0	0.2
O	10,139	88	626	1.1	138.3	138.3	138.5	0.2
P	10,613	35	231	2.7	138.4	138.4	138.7	0.3
Q	10,739	31	227	3.1	138.6	138.6	139.0	0.4

[1]Feet above confluence with Tualatin River

[2]Elevations computed without consideration of backwater effects from Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

ROCK CREEK SOUTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
SOUTH JOHNSON CREEK								
A	304	175	531	1.5	171.9	166.1[2]	166.7[2]	0.6
B	616	48	107	9.0	171.9	167.2[2]	167.3[2]	0.1
C	928	24	163	4.9	172.6	172.6	173.1	0.5
D	1,047	52	393	2.7	173.5	173.5	173.9	0.4
E	1,508	90	640	1.6	173.6	173.6	174.1	0.5
F	2,037	86	556	1.6	173.7	173.7	174.3	0.6
G	2,520	87	543	1.7	173.7	173.7	174.5	0.8
H	2,826	92	591	1.4	173.8	173.8	174.6	0.8
I	3,100	88	677	1.2	176.1	176.1	176.9	0.8
J	3,599	78	543	2.0	176.2	176.2	177.1	0.9
K	3,961	89	564	1.8	176.4	176.4	177.3	0.9
L	4,254	77	509	1.9	176.6	176.6	177.6	1.0
M	4,696	103	561	1.8	177.0	177.0	177.9	0.9
N	4,923	81	553	1.5	177.2	177.2	178.1	0.9
O	5,405	103	580	1.5	177.4	177.4	178.4	1.0
P	5,694	68	481	1.9	179.4	179.4	180.2	0.8
Q	5,954	58	405	2.0	179.4	179.4	180.3	0.9
R	6,327	47	283	2.6	179.6	179.6	180.5	0.9
S	6,506	57	355	1.7	180.5	180.5	181.3	0.8
T	6,631	55	323	2.2	180.5	180.5	181.4	0.9
U	6,869	47	263	2.7	180.7	180.7	181.5	0.8
V	7,155	57	398	1.7	180.9	180.9	181.8	0.9
W	7,411	71	420	1.5	181.0	181.0	181.9	0.9
X	7,646	28	141	4.5	181.9	181.9	182.4	0.5
Y	8,176	35	226	2.8	183.3	183.3	184.0	0.7
Z	8,326	35	273	2.3	183.4	183.4	184.3	0.9

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
SOUTH JOHNSON CREEK								
AA	8,827	65	266	2.8	184.3	184.3	185.2	0.9
AB	9,166	69	243	2.6	185.1	185.1	186.0	0.9
AC	9,349	54	262	2.4	185.6	185.6	186.6	1.0
AD	9,830	60	196	3.6	187.0	187.0	188.0	1.0
AE	10,279	40	143	4.4	190.1	190.1	191.0	0.9
AF	10,649	50	189	3.3	192.5	192.5	193.5	1.0
AG	10,929	55	171	3.7	193.9	193.9	194.9	1.0
AH	11,267	21	56	9.2	205.3	205.3	205.3	0.0
AI	11,357	75	429	1.2	208.3	208.3	208.4	0.1
AJ	11,730	30	136	4.3	215.4	215.4	215.8	0.4
AK	12,096	34	165	2.9	218.2	218.2	218.7	0.5
AL	12,352	48	153	3.3	218.6	218.6	219.6	1.0

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SOUTH JOHNSON CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
STOREY CREEK								
A	269	105	358	2.1	163.9	163.9	164.7	0.8
B	766	124	307	2.2	164.2	164.2	165.0	0.8
C	1,727	67	167	3.6	166.3	166.3	167.0	0.7
D	2,589	87	597	1.4	172.4	172.4	173.2	0.8
E	3,788	142	435	1.1	172.5	172.5	173.4	0.9
F	4,460	15	66	7.5	172.8	172.8	173.4	0.6
G	4,776	7	62	7.9	178.6	178.6	178.7	0.1
H	5,843	35	258	1.9	180.3	180.3	181.0	0.7
I	7,014	12	31	9.3	181.5	181.5	181.5	0.0
J	7,967	31	90	3.6	187.5	187.5	188.5	1.0
K	9,467	22	59	5.4	193.1	193.1	193.7	0.6
L	10,349	22	76	3.9	197.4	197.4	197.8	0.4

[1]Feet above confluence with Waible Gulch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

STOREY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
STOREY CREEK EAST TRIBUTARY								
A	1,478	21	30	6.9	174.0	174.0	174.0	0.0
B	2,489	72	477	0.4	184.7	184.7	184.7	0.0
C	3,701	17	61	2.6	185.7	185.7	186.0	0.3
D	4,398	14	31	5.4	187.9	187.9	188.0	0.1
STOREY CREEK MIDDLE TRIBUTARY								
A	806	14	46	5.1	180.2	180.2	181.2	1.0
B	1,041	18	56	3.1	181.7	181.7	182.4	0.7
C	1,741	44	58	4.0	184.7	184.7	184.7	0.0
D	1,861	20	93	1.9	186.0	186.0	186.6	0.6
E	3,103	12	23	8.1	188.9	188.9	188.9	0.0
F	4,063	31	119	1.8	196.0	196.0	196.8	0.8

[1]Feet above confluence with Storey Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

STOREY CREEK - EAST AND MIDDLE TRIBUTARIES

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
SUMMER CREEK								
A	0.02	161	1,365	1.1	161.2	159.9[2]	160.3[2]	0.4
B	0.09	66	385	3.8	161.2	159.9[2]	160.3[2]	0.4
C	0.17	46	369	3.9	161.7	161.7	162.7	1.0
D	0.40	101	528	2.7	163.8	163.8	164.7	0.9
E	0.80	191	922	1.6	167.1	167.1	167.6	0.5
F	1.19	186	1,457	0.9	173.6	173.6	174.5	0.9
G	1.23	186	1,827	0.7	173.6	173.6	174.5	0.9
H	1.28	186	1,803	0.7	173.7	173.7	174.6	0.9
I	1.32	186	1,995	0.7	173.7	173.7	174.7	1.0
J	1.36	186	1,532	0.9	173.7	173.7	174.7	1.0
K	1.45	65	238	5.6	173.6	173.6	174.6	1.0
L	1.56	48	269	4.7	175.2	175.2	175.8	0.6
M	1.70	101	542	2.4	175.8	175.8	176.6	0.8
N	1.75	61	322	3.7	177.1	177.1	177.6	0.5
O	1.93	126	553	2.2	178.1	178.1	179.0	0.9
P	1.97	111	498	2.4	178.4	178.4	179.4	1.0
Q	2.10	86	445	2.7	180.3	180.3	181.3	1.0

[1]Miles above confluence with Fanno Creek

[2]Elevations computed without consideration of backwater effects from Fanno Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

SUMMER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
AC	35,845	250/410	1,359	5.5	125.0	125.0	125.1	0.1
AD	37,920	284/509	446	6.3	125.3	125.3	125.4	0.1
AE	38,516	253/446	659	6.4	125.5	125.5	125.5	0.0
AF	40,752	126/380	895	5.9	125.9	125.9	126.1	0.2

[1]Feet above confluence with Willamette River

[2] Floodway width within City of Tualatin/Total floodway width

This FWDT shows the Tualatin River reach within city of Tualalatin in Clakamas County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER (WITHIN CITY OF TUALATIN IN WASHINGTON COUNTY)

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
A	41,903	255/392[2]	5,412	6.6	126.3	126.3	126.6	0.3
B	42,412	102/208[2]	4,425	7.6	126.6	126.6	126.9	0.3
C	42,588	200	4,446	7.8	126.8	126.8	127.2	0.4
D	43,443	374	6,532	5.3	127.9	127.9	128.6	0.7
E	44,042	419	5,825	6.0	128.3	128.3	129.0	0.7
F	44,631	286	6,050	5.5	128.9	128.9	129.6	0.7
G	45,713	235	5,458	6.3	129.1	129.1	129.9	0.8
H	46,125	586	8,671	3.9	129.7	129.7	130.6	0.9
I	46,325	609	8,920	4.3	129.7	129.7	130.6	0.9
J	47,537	638	8,638	4.4	130.2	130.2	131.1	0.9
K	47,907	555	8,688	4.3	130.4	130.4	131.3	0.9
L	48,547	1,038	17,752	1.8	130.8	130.8	131.7	0.9
M	51,159	1,308	20,386	2.3	131.0	131.0	131.9	0.9
N	53,386	1,290	16,561	3.2	131.1	131.1	132.1	1.0
O	55,226	1,335	20,165	1.5	131.5	131.5	132.5	1.0
P	59,644	498	10,118	3.9	132.4	132.4	133.3	0.9
Q	60,256	384	10,395	3.1	132.8	132.8	133.7	0.9
R	60,906	589	10,774	3.6	132.9	132.9	133.8	0.9
S	64,281	711	12,200	3.4	133.4	133.4	134.3	0.9
T	65,552	763	13,107	2.8	133.7	133.7	134.6	0.9
U	68,762	1,583	28,462	1.1	134.1	134.1	135.0	0.9
V	69,084	1,774	30,924	1.4	134.1	134.1	135.0	0.9
W	71,178	3,154	50,166	0.8	134.2	134.2	135.0	0.8
X	75,994	3,768	50,759	1.3	134.2	134.2	135.1	0.9
Y	80,096	3,862	52,093	0.5	134.3	134.3	135.2	0.9
Z	80,604	3,398	46,024	0.7	134.3	134.3	135.2	0.9

[1]Feet above confluence with Willamette River

[2]Floodway width within City of Tualatin/Total floodway width

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
AA	82,845	2,528	34,746	0.8	134.4	134.4	135.2	0.8
AB	83,267	2,483	33,631	1.1	134.4	134.4	135.3	0.9
AC	84,848	1,681	22,437	2.1	134.4	134.4	135.4	1.0
AD	85,487	792	9,994	3.0	134.6	134.6	135.5	0.9
AE	85,696	1,058	15,927	2.3	134.8	134.8	135.8	1.0
AF	86,585	846	15,373	2.4	135.1	135.1	136.0	0.9
AG[4]	189,211	1,859	21,962	1.5	144.3	141.6[3]	142.5[3]	0.9
AH	189,986	1,640	18,134	1.9	144.3	141.7[3]	142.6[3]	0.9
AI	190,800	1,424	16,228	2.2	144.3	141.9[3]	142.8[3]	0.9
AJ	192,431	1,760	22,170	1.4	144.3/144.3[2]	142.5[3]	143.4[3]	0.9
AK	193,436	2,289	24,940	1.4	144.8/144.3[2]	142.7[3]	143.5[3]	0.8
AL	196,851	1,941	20,385	1.7	145.6	143.2	144.0	0.8
AM	198,810	1,626	21,928	1.4	145.7	143.4	144.2	0.8
AN	200,975	1,278	16,681	2.0	146.2/146.1[2]	143.9	144.7	0.8
AO	201,438	1,208	14,856	2.5	146.2/146.2[2]	144.0	144.8	0.8
AP	201,868	1,089	13,267	2.8	146.4/146.3[2]	144.2	145.0	0.8
AQ	203,771	1,223	17,092	2.1	146.9/146.8[2]	145.0	145.8	0.8
AR	204,855	1,188	18,094	1.6	147.1/146.9[2]	145.3	146.1	0.8
AS	206,088	533	9,683	3.4	147.5	145.8	146.6	0.8
AT	207,184	1,298	15,646	2.3	147.9	146.3	147.1	0.8
AU	208,622	1,602	22,317	1.6	148.2	146.6	147.4	0.8
AV	209,541	974	15,152	2.1	148.3	146.8	147.5	0.7
AW	210,609	1,865	23,939	1.4	148.5	147.0	147.7	0.7
AX	211,885	1,807	27,553	1.3	148.5	147.1	147.8	0.7
AY	212,955	2,237	30,875	1.2	148.6	147.2	147.8	0.6
AZ	214,791	2,579	34,801	1.1	148.6	147.2	147.9	0.7

[1]Feet above confluence with Willamette River

[2]Riverward of levees / Landward of levees

[3]Elevations computed without consideration of effective water surface elevations downstream of detailed study limit.

[4]Break in detailed study reach between this and previous (downstream) reach

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER

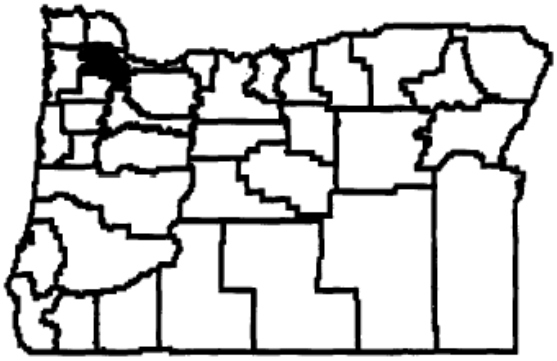
FLOOD INSURANCE STUDY



WASHINGTON COUNTY, OREGON
AND INCORPORATED AREAS

VOLUME 2 OF 3

COMMUNITY NAME	COMMUNITY NUMBER
BANKS, CITY OF	410239
BEAVERTON, CITY OF	410240
CORNELIUS, CITY OF	410261
DURHAM, CITY OF	410263
FOREST GROVE, CITY OF	410241
GASTON, CITY OF	410242
HILLSBORO, CITY OF	410243
KING CITY, CITY OF	410269
NORTH PLAINS, CITY OF	410270
SHERWOOD, CITY OF	410273
TIGARD, CITY OF	410276
TUALATIN, CITY OF	410277
WASHINGTON COUNTY UNINCORPORATED AREAS	410238



Effective: November 4, 2016

Federal Emergency Management Agency

Flood Insurance Study Number
41067CV002A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by a Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS report components.

Users should refer to Section 10.0, Revisions Descriptions. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: November 4, 2016

Revised FIS Report Dates:

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PUBLISHED SEPARATELY

Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
BA	217,311	2,233	28,663	1.2	148.7	147.3	147.9	0.6
BB	219,323	1,422	17,707	2.0	148.8	147.5	148.1	0.6
BC	221,593	1,174	17,034	1.8	149.1	147.9	148.4	0.5
BD	222,726	871	13,154	2.5	149.3	148.2	148.7	0.5
BE	223,235	806	13,426	2.3	149.5	148.4	148.9	0.5
BF	223,741	336	6,492	4.1	149.7	148.7	149.2	0.5
BG	224,390	1,467	22,664	1.3	150.0	149.0	149.5	0.5
BH	226,730	1,699	25,504	1.1	150.1	149.1	149.6	0.5
BI	228,021	2,418	40,601	0.6	150.2	149.2	149.6	0.4
BJ	231,304	1,773	29,358	1.0	150.2	149.2	149.7	0.5
BK	232,523	1,313	23,429	1.2	150.2	149.2	149.7	0.5
BL	232,955	1,403	25,216	1.0	150.2	149.3	149.8	0.5
BM	234,067	1,813	25,375	1.2	150.3	149.4	149.8	0.4
BN	235,438	4,157	63,549	0.5	150.4	149.4	149.9	0.5
BO	238,320	4,292	65,509	0.4	150.4	149.4	149.9	0.5
BP	239,100	4,048	53,848	0.6	150.6	149.7	150.1	0.4
BQ	241,242	2,841	43,797	0.4	150.6	149.7	150.2	0.5
BR	242,479	2,200	29,224	0.6	150.6	149.7	150.2	0.5
BS	244,011	1,646	18,860	1.1	150.7	149.8	150.3	0.5
BT	245,122	2,416	33,005	0.6	150.7	149.8	150.3	0.5
BU	246,362	3,129	37,738	0.5	150.7	149.9	150.4	0.5
BV	247,863	2,139	24,909	0.8	150.7	149.9	150.4	0.5
BW	249,989	1,499	17,142	1.3	150.8	150.0	150.5	0.5
BX	253,163	1,924	22,644	0.8	150.9	150.1	150.7	0.6
BY	254,474	1,922	21,616	0.9	151.0	150.2	150.7	0.5
BZ	255,565	1,461	13,740	1.6	151.0	150.3	150.9	0.6

[1]Feet above confluence with Willamette River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
CA	256,798	1,466	11,816	1.9	151.2	150.5	151.2	0.7
CB	259,904	2,269	20,512	1.0	151.5	150.9	151.5	0.6
CC	263,831	3,160	30,727	0.6	151.6	151.0	151.7	0.7
CD	267,035	2,897	20,735	0.9	151.6	151.0	151.7	0.7
CE	269,601	1,729	11,283	1.7	151.7	151.1	152.2	1.1
CF	272,457	2,370	10,495	2.4	152.5	152.2	152.8	0.6
CG	276,344	2,662	9,017	2.9	153.3	153.2	153.7	0.5
CH	279,491	2,041	11,179	1.9	155.1/154.5[2]	154.5	155.0	0.5
CI	280,650	442	3,867	3.0	155.8/155.2[2]	155.2	155.7	0.5
CJ	281,006	640	5,281	2.4	156.3	155.7	156.2	0.5
CK	282,345	1,287	10,297	1.2	156.5	156.0	156.5	0.5
CL	283,089	1,404	11,281	1.2	156.6	156.1	156.6	0.5
CM	285,799	1,407	7,629	1.8	157.0	156.6	157.2	0.6
CN	287,595	1,861	15,381	0.6	157.1/157.1[2]	156.7	157.4	0.7
CO	288,740	1,807	9,067	1.4	157.4/157.1[2]	156.8	157.5	0.7
CP	290,160	1,573	7,443	1.7	157.8/157.4[2]	157.1	157.7	0.6
CQ	290,683	1,210	5,774	2.2	158.0/157.5[2]	157.3	157.9	0.6
CR	291,511	1,336	5,457	2.7	158.4	157.8	158.4	0.6
CS	293,163	1,350	8,189	1.3	158.8	158.4	158.8	0.4
CT	294,353	1,181	5,293	2.2	159.0	158.6	159.1	0.5
CU	297,418	1,297	6,084	2.1	159.9	159.7	160.5	0.8
CV	298,748	1,634	9,627	1.2	160.3	160.2	160.8	0.6
CW	300,165	1,816	10,214	1.2	160.5	160.4	161.0	0.6
CX	301,036	2,116	11,015	1.1	160.7/160.6[2]	160.5	161.2	0.7
CY	301,979	3,473	20,188	0.8	162.1/160.8[2]	160.7	161.3	0.6
CZ	302,900	3,125	16,297	1.1	162.6/162.3[2]	160.8	161.5	0.7

[1]Feet above confluence with Willamette River

[2]Riverward of levees / Landward of levees

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER								
DA	303,252	2,724	12,480	1.2	163.1/162.3[3]	160.9	161.6	0.7
DB	304,049	3,134	15,878	1.1	163.7	163.3	163.4	0.1
DC	304,981	2,612	14,634	1.2	164.1/164.1[3]	163.8	164.1	0.3
DD	306,932	2,971	14,323	1.4	165.2/164.4[3]	164.1	164.4	0.3
DE	308,600	3,879	16,894	1.1	165.8/164.5[3]	164.3	164.7	0.4
DF	310,184	3,657	11,906	2.1	166.5/164.8[3]	164.6	165.0	0.4
DG	310,864	3,369	9,088	2.6	167.3/165.3[3]	165.2	165.5	0.3
DH	313,202	4,766	NA	NA	167.8	166.0	166.3	0.3
DI	315,004	3,626	NA	NA	167.8	166.1	166.4	0.3
DJ	317,283	2,352	23,065	0.3	167.8	166.1	166.4	0.3
DK	319,756	2,414	20,992	0.3	167.8	166.1	166.5	0.4
DL	321,765	2,275	12,707	0.6	167.8	166.1	166.5	0.4
DM	324,141	1,650	5,730	2.3	167.9	166.2	167.2	1.0
DN	328,153	730	4,239	2.3	170.1	170.4	170.7	0.3
DO	62.26[2]	660	4,062	2.8	170.6	170.6	171.4	0.8
DP	62.55[2]	1,700	12,197	0.9	171.5	171.5	172.5	1.0
DQ	63.20[2]	2,800	16,863	0.7	171.8	171.8	172.7	0.9
DR	63.69[2]	1,930	9,323	1.2	172.5	172.5	173.4	0.9
DS	63.75[2]	1,910	10,738	1.1	172.7	172.7	173.5	0.8
DT	64.29[2]	1,650	8,886	0.9	173.8	173.8	174.4	0.6
DU	64.74[2]	1,600	7,285	1.1	174.6	174.6	175.3	0.7
DV	65.15[2]	1,320	5,207	1.3	175.6	175.6	176.4	0.8
DW	65.62[2]	930	4,020	1.7	177.0	177.0	178.0	1.0
DX	65.73[2]	235	2,838	2.4	181.6	181.6	181.9	0.3
DY	65.75[2]	240	3,976	1.7	182.1	182.1	182.4	0.3
DZ	65.80[2]	230	1,181	5.8	182.2	182.2	182.6	0.4
EA	65.89[2]	650	3,480	2.0	184.6	184.6	185.0	0.4
EB	66.49[2]	600	2,961	2.3	187.4	187.4	188.1	0.7

[1]Feet above confluence with Willamette River

[2]Miles above confluence with Willamette River

[3]Riverward of levees / Landward of levees

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TUALATIN RIVER - GOLF COURSE OVERFLOW								
A	463	400	1813	1.8	155.3	154.7[3]	155.2	0.5
B	860	178	876	4.5	155.9	155.6[3]	156.3	0.7
C	1088	115	939	4.1	157.8	157.7[3]	157.9	0.2
D	1290	131	1066	3.7	158.7	158.6[3]	158.9	0.3
E	1805	335	2398	1.9	159.5	159.5[3]	159.9	0.4
F	2100	303	2546	2.2	159.7	159.7[3]	160.1	0.4
G	3352	622	3605	1.6	160.6	160.6[3]	161.1	0.5
H	4210	658	3739	1.5	161.1	161.1[3]	161.7	0.6
I	4999	854	4416	1.2	161.4	161.4[3]	162.1	0.7
J	5791	1081	6054	0.8	161.5	161.5[3]	162.4	0.9
TUALATIN RIVER - LaFOLETTE OVERFLOW								
A	852[2]	215	1,465	1.3	156.7	156.2[3]	156.8	0.6
B	1,535[2]	162	1,016	1.9	157.1	156.7[3]	157.3	0.6
C	2,203[2]	143	1,000	2.1	157.8	157.6[3]	158.2	0.6
D	2,650[2]	165	1,234	1.6	158.2	158.0[3]	158.7	0.7
E	3,194[2]	91	728	2.8	159.8	159.7[3]	160.2	0.5

[1]Feet above confluence with Tualatin River

[2]Feet above confluence with Tualatin River

[3]Elevations computed without consideration of levees along Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TUALATIN RIVER - GOLF COURSE AND LaFOLETTE OVERFLOWS

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TURNER CREEK								
A	201	55	337	1.2	147.0	133.5[2]	134.4[2]	0.9
B	580	45	183	2.8	147.0	133.6[2]	134.6[2]	1.0
C	1,214	40	136	3.5	147.0	135.6[2]	136.0[2]	0.4
D	1,437	20	126	3.3	147.0	139.0[2]	139.1[2]	0.1
E	1,846	39	213	2.2	147.0	139.3[2]	139.9[2]	0.6
F	2,048	40	207	2.3	147.0	139.4[2]	140.2[2]	0.8
G	2,451	51	237	2.3	147.0	139.7[2]	140.7[2]	1.0
H	3,149	84	273	1.5	147.0	140.5[2]	141.2[2]	0.7
I	3,734	42	64	7.3	147.0	142.6[2]	142.8[2]	0.2
J	4,079	43	142	3.2	147.0	144.8[2]	145.4[2]	0.6
K	4,341	47	140	3.0	147.0	145.4[2]	146.1[2]	0.7
L	4,704	85	204	1.9	147.0	146.2[2]	146.8[2]	0.6
M	4,868	35	123	3.4	149.7	149.7	149.7	0.0
N	5,162	53	237	1.4	149.9	149.9	150.0	0.1
O	5,524	42	140	2.3	150.0	150.0	150.4	0.4
P	5,782	70	200	1.6	150.3	150.3	150.8	0.5
Q	6,219	47	102	3.5	151.2	151.2	151.6	0.4
R	6,421	16	54	4.3	152.3	152.3	152.8	0.5
S	6,788	25	84	3.0	153.2	153.2	154.1	0.9
T	6,997	15	53	4.3	154.0	154.0	155.0	1.0
U	7,302	43	194	0.9	157.2	157.2	157.6	0.4
V	7,565	23	100	1.7	157.2	157.2	157.7	0.5
W	7,729	5	25	8.7	157.1	157.1	157.4	0.3
X	7,837	21	115	1.7	158.3	158.3	158.5	0.2
Y	8,201	10	43	4.5	158.4	158.4	158.9	0.5
Z	8,356	9	37	5.2	160.9	160.9	161.3	0.4

[1]Feet above confluence with Rock Creek North

[2]Elevations computed without consideration of backwater effects from Rock Creek North and Tualatin River

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TURNER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
TURNER CREEK								
AA	8,593	24	85	2.1	161.8	161.8	162.5	0.7
AB	8,861	23	69	1.9	162.0	162.0	163.0	1.0
AC	9,390	23	47	2.8	163.7	163.7	164.7	1.0
AD	9,900	72	184	0.8	164.6	164.6	165.2	0.6
AE	10,123	26	33	2.9	164.7	164.7	165.2	0.5
AF	10,373	11	24	4.0	166.7	166.7	167.1	0.4
AG	10,483	12	26	3.7	168.1	168.1	168.1	0.0

[1]Feet above confluence with Rock Creek North

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

TURNER CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
UNNAMED TRIBUTARY OF McKAY CREEK								
A	32	142	504	0.6	172.9	172.9[2]	173.8[2]	0.9
B	434	70	866	0.4	172.9	172.9[2]	173.9[2]	1.0
C	1370	6	72	4.4	172.9	172.9[2]	173.9[2]	1.0
D	1440	25	333	1.0	175.1	175.1	176.1	1.0
E	3080	160	1,137	0.3	175.2	175.2	176.2	1.0
F	3820	21	116	2.8	176.2	176.2	177.0	0.8
G	4610	60	241	1.3	176.7	176.7	177.6	0.9
H	4990	27	106	2.6	177.2	177.2	178.0	0.8
I	5340	80	180	1.5	178.9	178.9	179.5	0.6
J	5590	100	311	0.9	179.1	179.1	179.6	0.5
K	6060	100	675	0.4	179.3	179.3	180.2	0.9
L	6210	8	59	4.7	180.8	180.8	181.8	1.0
M	6450	200	1,057	0.3	183.0	183.0	184.0	1.0
N	6750	160	699	0.4	183.0	183.0	184.0	1.0

[1]Feet above confluence with McKay Creek

[2]Elevations computed with consideration of backwater effects from McKay Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED TRIBUTARY OF McKAY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WAIBLE CREEK								
A	1,795	147	875	3.3	160.0	154.8[2]	155.4[2]	0.6
B	3,661	125	729	3.7	160.0	156.9[2]	157.8[2]	0.9
C	5,017	174	1,061	2.9	160.0	158.3[2]	159.3[2]	1.0
D	7,646	250	1,380	2.5	160.0	159.8[2]	160.8[2]	1.0
E	8,074	41	323	6.0	160.8	160.8	161.5	0.7
F	11,056	260	1,077	3.0	163.5	163.5	164.0	0.5
G	12,421	161	533	3.6	165.9	165.9	166.3	0.4
H	13,228	166	566	3.0	167.6	167.6	168.1	0.5
I	14,305	69	332	4.0	170.0	170.0	170.7	0.7
J	14,377	85	455	3.8	173.1	173.1	173.1	0.0
K	15,962	80	301	3.1	174.5	174.5	175.4	0.9
L	16,532	90	282	3.7	175.4	175.4	176.4	1.0
M	16,633	103	318	3.3	175.6	175.6	176.6	1.0
N	17,540	124	363	2.8	177.3	177.3	178.0	0.7
O	18,524	139	359	3.0	178.9	178.9	179.4	0.5
P	19,742	27	87	5.8	179.8	179.8	180.0	0.2
Q	20,829	10	79	9.5	184.0	184.0	184.5	0.5

[1]Feet above confluence with McKay Creek

[2]Elevations computed without consideration of backwater effects from McKay Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WAIBLE CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WAIBLE CREEK - SOUTH TRIBUTARY								
A	1,457	22	71	5.6	182.9	182.9	183.9	1.0
B	1,610	70	207	2.1	185.7	185.7	186.4	0.7
C	2,523	80	130	3.8	187.1	187.1	187.6	0.5

[1]Feet above confluence with Waible Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WAIBLE CREEK - SOUTH TRIBUTARY

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WAPATO CREEK								
A	0.37	778	4,817	0.3	173.9	173.3[3]	174.3[3]	1.0
B	1.34	520	3,152	0.4	174.6	173.4[3]	174.4[3]	1.0
C	1.76	312	1,962	0.6	175.5	173.4[3]	174.4[3]	1.0
D	1.90	110	1,045	1.1	175.6	173.5[3]	174.5[3]	1.0
E[4]	NA	NA	NA	NA	NA	NA	NA	NA
F[4]	NA	NA	NA	NA	NA	NA	NA	NA
G[4]	NA	NA	NA	NA	NA	NA	NA	NA
WEST FORK DAIRY CREEK								
A	15.70[2]	1,995	10,690	0.8	189.8	189.8	190.8	1.0
B	16.02[2]	1,941	12,626	0.7	193.9	193.9	194.8	0.9
C	16.28[2]	2,300	21,187	0.4	194.6	194.6	195.6	1.0
D	16.84[2]	2,700	17,943	0.4	194.8	194.8	195.8	1.0
E	17.82[2]	2,450	16,122	0.4	200.3	200.3	201.3	1.0
F	18.68[2]	1,200	6,645	1.1	206.3	206.3	207.2	0.9
G	18.98[2]	1,500	10,148	0.7	206.5	206.5	207.4	0.9
H	19.41[2]	690	1,305	5.4	206.9	206.9	207.5	0.6

[1]Miles above confluence with Tualatin River

[2]Miles above confluence with Dairy Creek

[3]Elevations computed without consideration of backwater effects from Tualatin River

[4]Cross sections are located in Yamhill County, OR

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WAPATO CREEK - WEST FORK DAIRY CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK								
A	634	72	245	7.4	161.7	154.2[2]	155.2[2]	1.0
B	1,055	80	382	4.7	161.7	157.1[2]	157.5[2]	0.4
C	1,475	67	252	5.7	161.7	158.1[2]	158.9[2]	0.8
D	1,812	25	138	8.6	161.7	160.0[2]	160.8[2]	0.8
E	2,550	89	534	2.4	163.2	163.2	163.6	0.4
F	3,099	91	478	2.3	163.5	163.5	163.9	0.4
G	3,671	75	418	2.7	164.1	164.1	164.7	0.6
H	4,056	75	359	3.6	164.6	164.6	165.4	0.8
I	4,578	34	178	7.2	166.7	166.7	167.2	0.5
J	4,723	57	421	2.6	168.8	168.8	169.4	0.6
K	5,268	62	360	2.4	169.1	169.1	169.8	0.7
L	5,930	39	197	3.2	169.2	169.2	170.1	0.9
M	6,344	22	110	5.8	170.1	170.1	171.1	1.0
N	6,455	33	241	2.8	176.3	176.3	176.9	0.6
O	6,754	49	406	2.0	176.3	176.3	177.0	0.7
P	7,352	50	248	3.4	176.5	176.5	177.3	0.8
Q	7,688	53	250	2.7	177.0	177.0	177.8	0.8
R	8,186	69	226	3.2	177.7	177.7	178.6	0.9
S	8,383	16	133	4.5	182.2	182.2	182.2	0.0
T	9,009	50	221	3.1	182.9	182.9	183.6	0.7
U	9,433	50	246	2.5	183.3	183.3	184.0	0.7
V	9,850	42	165	3.9	183.9	183.9	184.6	0.7
W	10,334	44	196	3.0	185.0	185.0	185.8	0.8
X	11,481	43	112	5.5	189.3	189.3	189.8	0.5
Y	11,652	34	164	3.4	191.3	191.3	192.1	0.8
Z	12,000	61	191	3.4	192.1	192.1	193.1	1.0

[1]Feet above confluence with Beaverton Creek

[2]Elevations computed without consideration of backwater effects from Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ.FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
WILLOW CREEK								
AA	12,444	60	124	5.4	194.8	194.8	195.1	0.3
AB	12,686	135	311	2.7	195.7	195.7	196.2	0.5
AC	12,965	116	196	3.9	196.6	196.6	196.9	0.3
AD	13,396	55	137	3.7	198.4	198.4	198.9	0.5
AE	13,596	14	105	4.0	202.7	202.7	202.8	0.1
AF	13,865	16	114	3.7	202.8	202.8	203.2	0.4
AG	14,652	23	95	4.4	205.0	205.0	205.2	0.2
AH	15,104	46	124	3.5	207.4	207.4	207.9	0.5
AI	15,441	32	99	4.9	209.3	209.3	210.0	0.7
AJ	15,823	19	78	5.2	212.4	212.4	213.3	0.9
AK	16,327	26	111	4.0	216.0	216.0	216.7	0.7
AL	16,644	32	117	3.6	217.2	217.2	218.0	0.8
AM	16,766	29	114	2.9	218.2	218.2	219.0	0.8
AN	16,911	56	304	1.7	220.7	220.7	221.5	0.8
AO	17,222	30	100	3.6	221.1	221.1	221.6	0.5
AP	17,530	33	110	3.0	222.2	222.2	223.2	1.0
AQ	17,840	24	81	4.0	223.7	223.7	224.3	0.6
AR	18,331	13	49	7.5	227.4	227.4	227.9	0.5
AS	18,609	18	66	5.4	230.4	230.4	230.9	0.5
AT	18,907	27	90	4.4	232.0	232.0	232.8	0.8
AU	19,203	13	46	6.9	233.9	233.9	234.6	0.7
AV	19,541	48	204	1.5	235.6	235.6	236.5	0.9
AW	19,595	45	204	1.5	235.7	235.7	236.5	0.8
AX	19,789	49	170	1.8	236.2	236.2	236.9	0.7
AY	19,871	75	244	1.2	238.0	238.0	238.1	0.1
AZ	20,085	48	127	2.4	238.1	238.1	238.2	0.1
BA	20,282	36	125	2.4	238.9	238.9	239.0	0.1

[1]Feet above confluence with Beaverton Creek

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base (1-percent-annual-chance) Flood Elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 sq. mi., and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Washington County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on the FBFMs, where applicable. Historical data relating to the maps prepared for each community are presented in Table 6, "Community Map History."

7.0 OTHER STUDIES

In 1969, the USACE prepared a Floodplain Information report for Washington County (Reference 28). The 1-percent-annual-chance flood profiles of the Tualatin River tributary streams in this report are based on available data at scattered locations along those Streams. The 1-percent-annual-chance flood profiles of this study are based on mathematical computer analyses using topographic maps and field surveys. Thus, the difference in flood heights is a result of two factors: (1) improved data obtained for the FISs; and (2) lower frequency-discharges that reflect the 1974 completion of the upstream Henry Hagg Lake Project.

FISs have been published for the adjacent Counties of Clackamas (Reference 29) and Tillamook (Reference 30). FHBMs have been published for Columbia County (Reference 31) and the City of Lake Oswego (Reference 32). This FIS is in agreement with these studies.

The published FIS for the City of Portland (Reference 33) does not match this FIS concerning the southwestern corporate limits of Portland. Three "finger" areas of Portland extend into Washington County where flooding is shown in the Washington County study but not studied for the Portland study. The Portland study will be revised to match the adjacent flooded areas in Washington County.

An FHBM for Washington County has been previously published (Reference 26). This FIS is more detailed; therefore, the FIRM supersedes that map.

The engineering consulting firm Kramer, Chin and Mayo, Inc., prepared the Beaverton Creek Flood Study for the City of Beaverton in April 1979 (Reference 34). The study included flood profiles for the 10-, 2-, and 1-percent-annual-chance floods. In August 1982, an updated study was prepared to reflect differences in hydrology and hydraulics resulting from culvert improvements at the SPRR and in the Canyon Road area (Reference 14).

An FIS for the unincorporated areas of Yamhill County, Oregon, is being prepared (Reference 35). Wapato Creek was studied by approximate methods in that study and the 1-percent-annual-chance flood boundaries generally agree between the Yamhill County study and this study.

This FIS report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISION DATE(S)	FLOOD INSURANCE RATE MAP EFFECTIVE DATE	FLOOD INSURANCE RATE MAP REVISION DATE(S)
* Banks, City of	N/A	N/A	N/A	-
Beaverton, City of	February 1, 1974	June 25, 1976	September 28, 1984	February 4, 1987 February 8, 2005
Cornelius, City of	November 5, 1976	N/A	January 6, 1982	-
Durham, City of	November 12, 1976	N/A	January 6, 1982	February 18, 2005
Forest Grove, City of	March 1, 1974	April 16, 1976	March 15, 1982	-
Gaston, City of	July 5, 1982	N/A	July 5, 1982	-
Hillsboro, City of	April 12, 1974	April 15, 1977	May 17, 1982	-
King City, City of	February 18, 2005	N/A	February 18, 2005	-
North Plains, City of	July 16, 1976	N/A	April 1, 1982	March 16, 1989
Sherwood, City of	August 13, 1976	N/A	January 6, 1982	-
Tigard, City of	February 14, 1978	N/A	March 1, 1982	February 18, 2005
Tualatin, City of	May 20, 1977	May 2, 1978	February 17, 1982	February 19, 1987
Washington County, Unincorporated Areas	January 24, 1975	September 13, 1977	September 30, 1982	March 18, 1987 February 18, 2005

* This community does not have map history prior to the first countywide mapping.

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region X, Federal Regional Center, 130 228th Street, SW, Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

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Federal Emergency Management Agency, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995

10.0 REVISIONS DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS reports for the individual communities were printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data located at the Department of Land and Water Resources, 201 South Jackson Street, Suite 600, Seattle, Washington 981-3855.

10.1 First Revision

Countywide Update

The countywide update was performed by Black & Veatch Corporation for the Federal Emergency Management Agency (FEMA), under Contract No. HSFEHQ-04-D-0025 and was completed in September 2010.

This update combined the Flood Insurance Rate Maps and Flood Insurance Study reports for Washington County and incorporated communities into the countywide format. Under the countywide format, Flood Insurance Rate Map panels have been produced using a single layout format for the entire area within the County instead of separate layout formats for each community. The single-layout format facilitates the matching of adjacent panels and depicts the flood-hazard area within the entire panel border, even in areas beyond a community's corporate boundary line. In addition, under the countywide format, this single Flood Insurance Study report provides all Flood Insurance Study information and data for the entire County area.

All flood elevations shown in this FIS report and on the FIRM panels were converted from NGVD 29 to NAVD 88. The conversion factor from NGVD to NAVD for all streams in this report is +3.52 feet.

As apart of the countywide format, Tualatin River and its major tributaries were studied. Approximately 167.20 miles of waterways located in Washington County, Oregon were either newly studied or restudied. A total of 46.68 miles were redelineated from the effective flood insurance rate maps.

Tualatin River and its tributaries study was completed by Pacific Water Resources, Inc. (PWR) under contract to Clean Water Services (CWS) in January 2006. Table 7 shows the streams that were studied and restudied in Washington County.

In June 2000, as part of a comprehensive project called Watersheds 2000, CWS contracted with three consulting engineering firms to create HEC-HMS and HEC-RAS models of streams in its service area. CWS divided the streams into three regions: East, Central, and South. PWR created models in the East region plus the upper Tualatin River, TetraTech/KCM (TTKCM) created models in the Central region, and Phil Williams & Associates, Inc. (PWA) created models in the South region plus the lower Tualatin River.

In November 2001, as part of the Tualatin Basin Floodplain Mapping project, CWS contracted with PWR to take about 167.2 miles of the HEC-RAS models in Washington County developed for the Watersheds 2000 project and complete a detailed riverine flood insurance restudy for all three regions plus the upper and lower Tualatin River. This work included incorporating models originally developed by TTKCM and PWA and developing floodway models, then creating the mapping layers and the compiling the FEMA submission.

The February 1996 flood on the Tualatin River was the largest flood flow ever recorded with an estimated 1.2-percent-annual-chance flood. However, for almost all of the smaller urbanized Tualatin River tributaries that were studied, the November 1996 flood is thought to be the largest flood ever observed with an estimated 25-year return interval and an annual probability of recurrence of 4 percent.

Table 7 - Revised Waterway Study Reaches

Reach Name	Reach Location	Approximate Reach Miles
Beal Creek	Mouth to 700 feet above Main St	0.52
Beaverton Creek	Mouth to SW 78th Ave	11.70
Bethany Creek	Mouth to 1200 feet above NW 174th Ave	1.13
Bronson Creek	Mouth to below NW Laidlaw Road	5.45
Butternut Creek	Mouth to SW Farmington Road	5.11
Cedar Creek	Mouth to above SW Sunset Blvd	2.93
Cedar Mill Creek	Mouth to 800 feet upstream of NW 113th Ave	4.90
Celebrity Creek	Mouth to below SW Farmington Road	1.05
Chicken Creek	Mouth to SW Edy Road	2.90
Chicken Creek - West Fork	Mouth to to 1500 feet upstream	0.29
Council Creek	Mouth to Purdin Road (Verboort Road)	6.68
Dairy Creek	Mouth to mile 4.7	4.71
Dawson Creek	Mouth to 1500 feet above NE Shute Road	3.06
Deer Creek	Mouth to NW 174th Ave	0.65
Erickson Creek	Mouth to 350 feet above SW 10th Ave	1.64
Glencoe Swale	Mouth to 2800 feet above NW Sewell Road	4.07
Golf Creek	Mouth to SW Canyon Road	0.67
Gordon Creek	Mouth to to 500 feet below T.V. Hwy	1.91
Hall Creek	Mouth to SW 99th Ave	2.20
Hall - Middle Fork	Mouth (SW 99th Ave) to SW 87th Ave	0.76
Hall - North Fork	Mouth to below Hwy 217 Ramp	0.61
Hall - South Fork	Mouth (SW 99th Ave) to SW 86th Ave	0.80
Hall - SW 106th Ave Trib	Mouth to below SW Walker Road	0.54
Hedges Creek	Mouth to edge of mapping near SW Myslony Street	2.69
Holcomb Creek	Mouth to below gravel road 2800 feet below Dick Rd.	2.02
Johnson Creek North	Mouth to 800 feet below SW Brookside Drive	2.73
Johnson Creek North - East Trib	Mouth to 600 feet SW 99th Ave	0.36
Johnson Creek North – N. Trib	Mouth to below SW 107th Ave	0.60
Johnson Creek South	Mouth to SW Hart Road	2.37
McKay Creek	Mouth to P&W Railroad, above NW West Union Rd	10.30
Nyberg Creek	Mouth to below SW Boones Ferry Road	2.54
Rock Creek	Mouth to below P&W Railroad	16.80
Rock Creek South	Mouth to Oregon Street	2.05
Storey Creek	Mouth to mile 2.0	1.97
Storey Creek - East Trib	Mouth to mile 0.8	0.84
Storey Creek - Middle Trib	Mouth to NW West Union Road	0.77
Tualatin River	Mouth to to River Mile 17.1	17.11
Tualatin River	500 feet below Butternut Creek to 7500 feet above Gales Creek	26.78
Turner Creek	Mouth to below NE Cornell Rd. near Hillwood Dr.	1.99
Waible Creek	Mouth to NW West Union Road	4.93
Waible - North Trib	Mouth to NW West Union Road	0.60
Waible - South Trib	Mouth to NW Jacobson Road	1.62
Willow Creek	Mouth to NW 141st Place	3.85

The flood peak discharges used for mapping the flooding along the mainstem of the Tualatin River including the Rivergrove Gap and Oswego Canals were based on a flood frequency analysis of historic gaged annual peak flows after accounting for the effect of the upstream regulation at Hagg Lake. This analysis was documented in the report entitled "Estimated Flood Peak Discharges of the Tualatin River" dated May 2003 (revised), prepared for CWS of Washington County Oregon by Roger Sutherland, PE and Seth Jelen, PE of PWR. The flood peak discharges for mapping the flooding along the tributary waterways of the Tualatin River were based on HEC-HMS hydrologic modeling of these watersheds. The hydrologic modeling techniques used were documented in the report entitled "Hydrologic Modeling for the Watersheds 2000 Project" (Tributary Report) dated June 2, 2003, prepared for CWS of Washington County Oregon by Phillip Pommier, PE, of PWR.

The proposed discharges for the Tualatin tributary stream, which were developed from HEC-HMS modeling and account for snowmelt and antecedent moisture conditions, are reasonable and appropriate.

The Peak discharge for the February 1996 flood along the Tualatin River was recorded at the following USGS gaging stations: Dilley; Golf Course Road; Road Bridge; Farmington; and West Linn.

Digital methods were used wherever possible to reduce redundant work effort and automate the direct transfer of data. They were used to directly convert a network of sections and alignments into section positions and distances, and to convert survey and data to the model ground cross sections, and to automatically map the 1- and 0.2-percent-annual-chance floodplain boundaries using digital three-dimensional face data. Digital methods were used to directly map the floodway boundaries based on widths from the model output and to use that same data for the floodway data table in a spreadsheet.

Analyses for water surface profiles were done with the USACE HEC-RAS Version 3.11 and PWR confirmed that reaches can be executed in Version 3.12.

In keeping with NFIP standard methods, PWR used normal depth (using average floodplain slope at the bottom) as the downstream boundary condition for modeling the base and encroached-floodway profiles, then applied backwater from downstream sources to obtain the regulatory 1-percent-annual-chance flood elevation used for the floodway data table, the profiles, and the floodplain mapping. This is also consistent with the downstream condition used in the effective profiles for those streams being restudied.

In some cases, PWR concluded that two stream systems were so near each other and so similar in size and orientation that it would be more appropriate to model their flood peak as coincident in time from the same flooding source. In these cases, the models were combined into a single HEC-RAS model and the hydraulics of their junction modeled within HEC-RAS automatically. These streams include the Cedar Mill-North Johnson Creek system, the Storey Creek system, the Waible Creek system, and the Beaverton-Hall Creek system. Even in these cases, the downstream boundary condition of the primary creek was modeled using normal depth with backwater from its receiving water as described above.

Note that the City of Tualatin is a multi-county community with areas in Washington and Clackamas counties. The Washington County DFIRM was previously clipped to the Washington County boundary, and as a result the City of Tualatin was split between Washington County and Clackamas County. In order to avoid having two reference maps and FIS reports for the City of Tualatin, and also considering the FEMA guidelines for multi-county communities, the Washington County DFIRM was extended into Clackamas County to include the full extent of the City of Tualatin. This inclusion adds a 5541 ft reach of the Tualatin River and a 1805 ft reach of Nyberg Slough to the Washington County DFIRM and FIS. Cross section lettering along the Tualatin River matches the Clackamas County DFIRM to cross section “AF” (county boundary), at which point the cross section lettering sequence resets to “A”. The cross section lettering on the Nyberg Slough is continuous.

Note that with the Beaverton-Hall Creek system the junction involved a hydraulically complex underground junction modeled externally using the Water Surface Pressure Gradient for Windows (WSPGW) model with overflow balanced using HEC-RAS. Although Hall and Beaverton Creeks share hydraulics of this junction as if they were tributaries to a single larger watershed, Hall Creek is modeled as a separate HEC-RAS model using a starting (downstream) condition rating curve developed from the WSPGW model at that junction.

As noted in the April 2003 Guidelines, PWR did check water surface elevations in each tributary that was modeled separately from its main stream and found that the main stream was always higher.

Channel and overbank roughness factors (Mannings “n” values) were assigned based on field visits and recent high resolution aerial photos. The range of both channel and overbank “n” values used in each of the hydraulic models are shown in Table 4. In 2000, PWR submitted the Fanno Creek FIS restudy, which is also in the Tualatin Basin (between the East and South regions). The calibration of Fanno Creek hydraulic model supported much higher “n” values than those that are generally found in

common literature sources such as Chow and USGS, the “n” values were ultimately lowered to a more reasonable range.

The “n” values used for the Tualatin Basin Floodplain Mapping Project were based on a tabulation of values and their corresponding description of channel and overbank characteristics. The three modeling teams (from the Watersheds 2000 work) for this project coordinated and agreed based on professional engineering judgment to use these “n” value tables.

Water surface profile computations at bridges are based on present normal bridge openings. Consideration was not given either to the possible blockage of bridge openings by sediment and debris or to future bridge enlargement.

All elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88).

New 2-foot contour maps for Ash Creek, Fanno Creek and Summer Creek, based on aerial photography taken in December, 1997 (Reference 24), were developed by David Smith and Associates.

This study matches downstream backwater elevations from the existing published FIS for the Tualatin River. An additional study for areas of Fanno Creek upstream of Washington County (i.e., City of Portland) has not been published yet.

BACKWATER FROM FANNO CREEK

CONFLUENCE WITH FANNO CREEK

RAILROAD

GREENBURG ROAD

SHADY LANE

HIGHWAY 217 (SHADE AVENUE)

ELEVATION IN FEET (NAVD 88)

185
180
175
170
165
160
155
150
145

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH FANNO CREEK

A B C D E F G

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

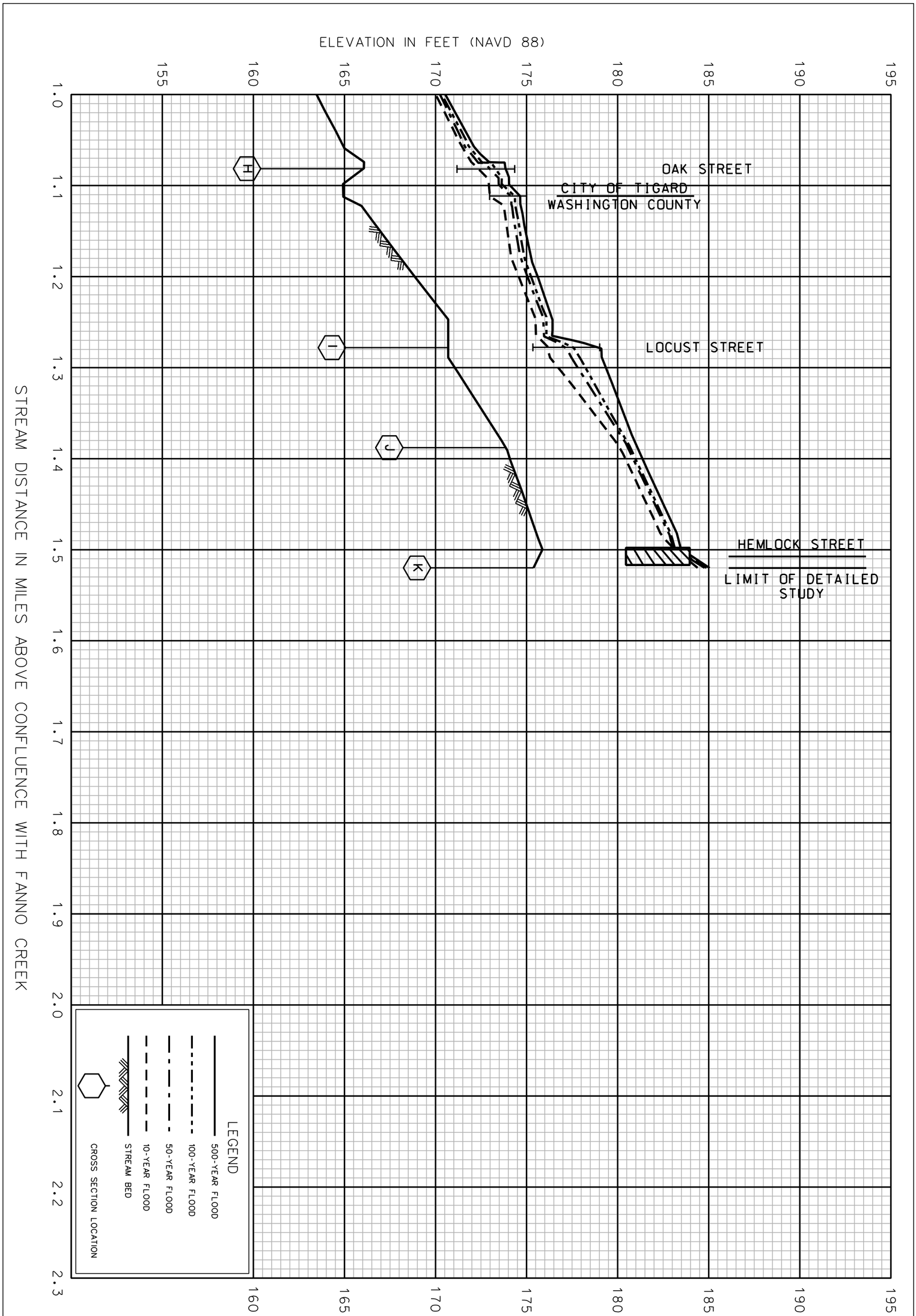
FLOOD PROFILES

ASH CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

01P

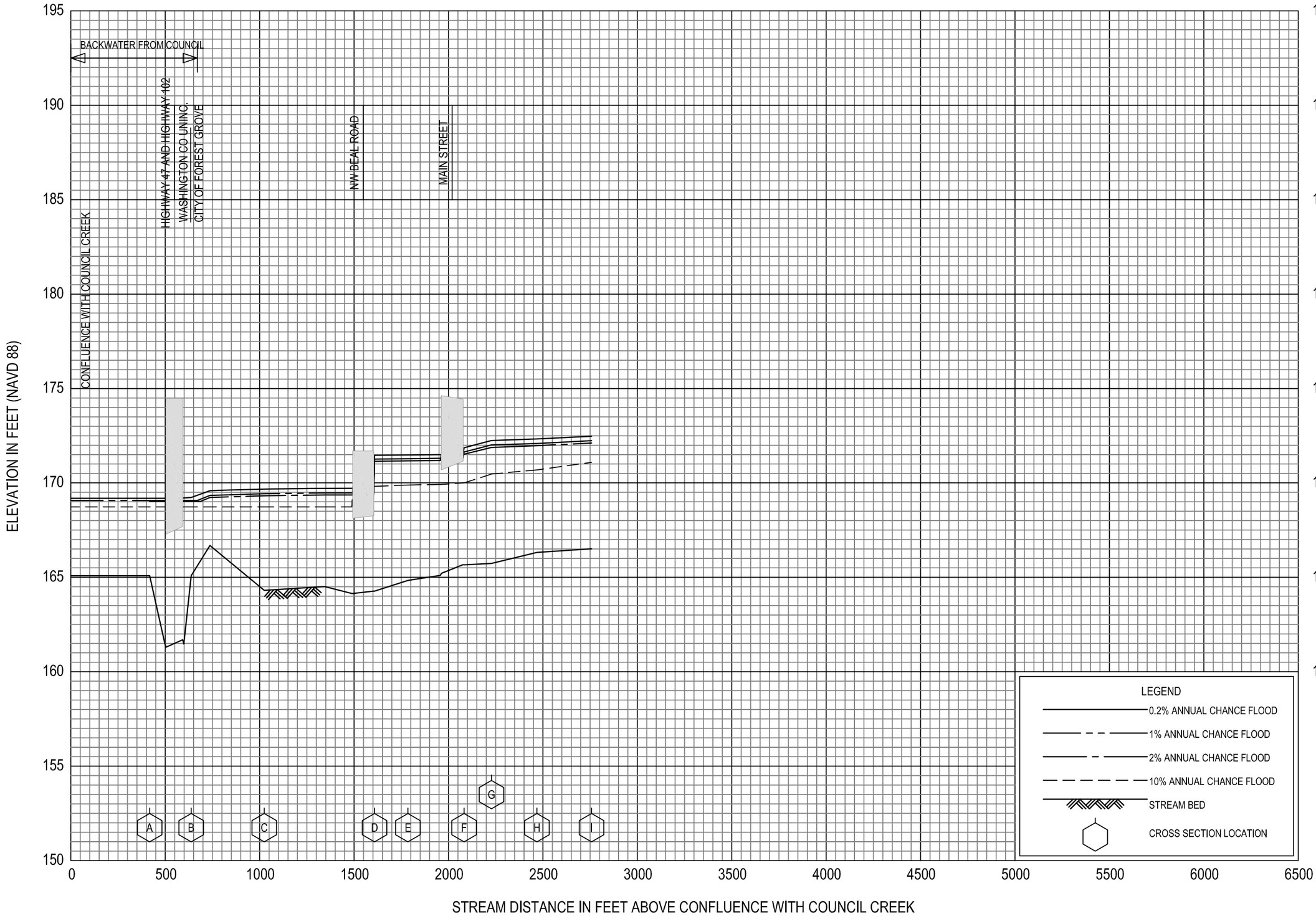


02P

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

ASH CREEK



FLOOD PROFILES

BEAL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

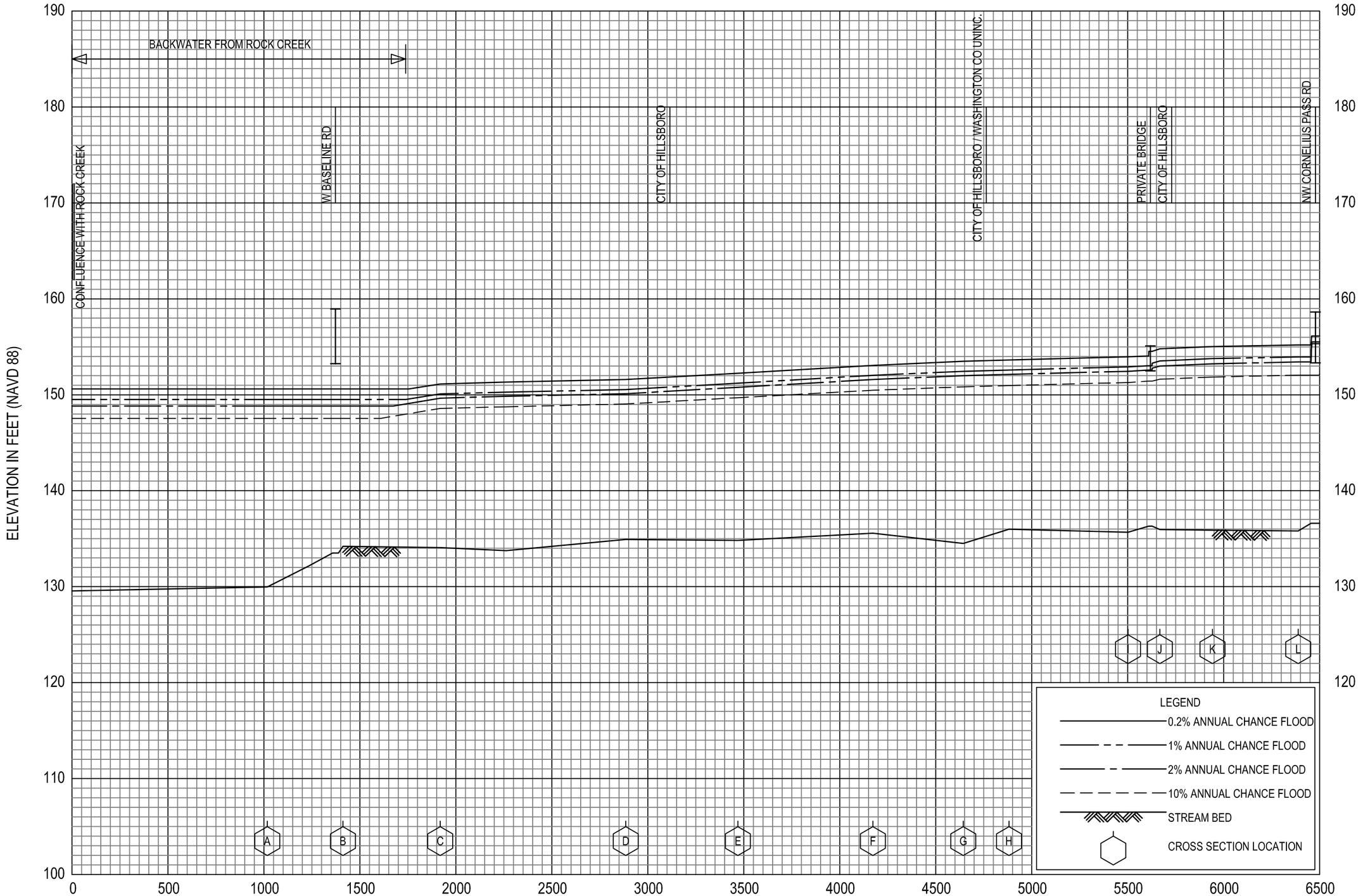
03P

FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



04P

FLOOD PROFILES

BEAVERTON CREEK

ELEVATION IN FEET (NAVD 88)

200
190
180
170
160
150
140
130
120
110

WASHINGTON CO UNINC.
FOOTBRIDGE
SW 206TH AVE
CONFLUENCE WITH BRONSON CREEK

M N O P Q R S T U V

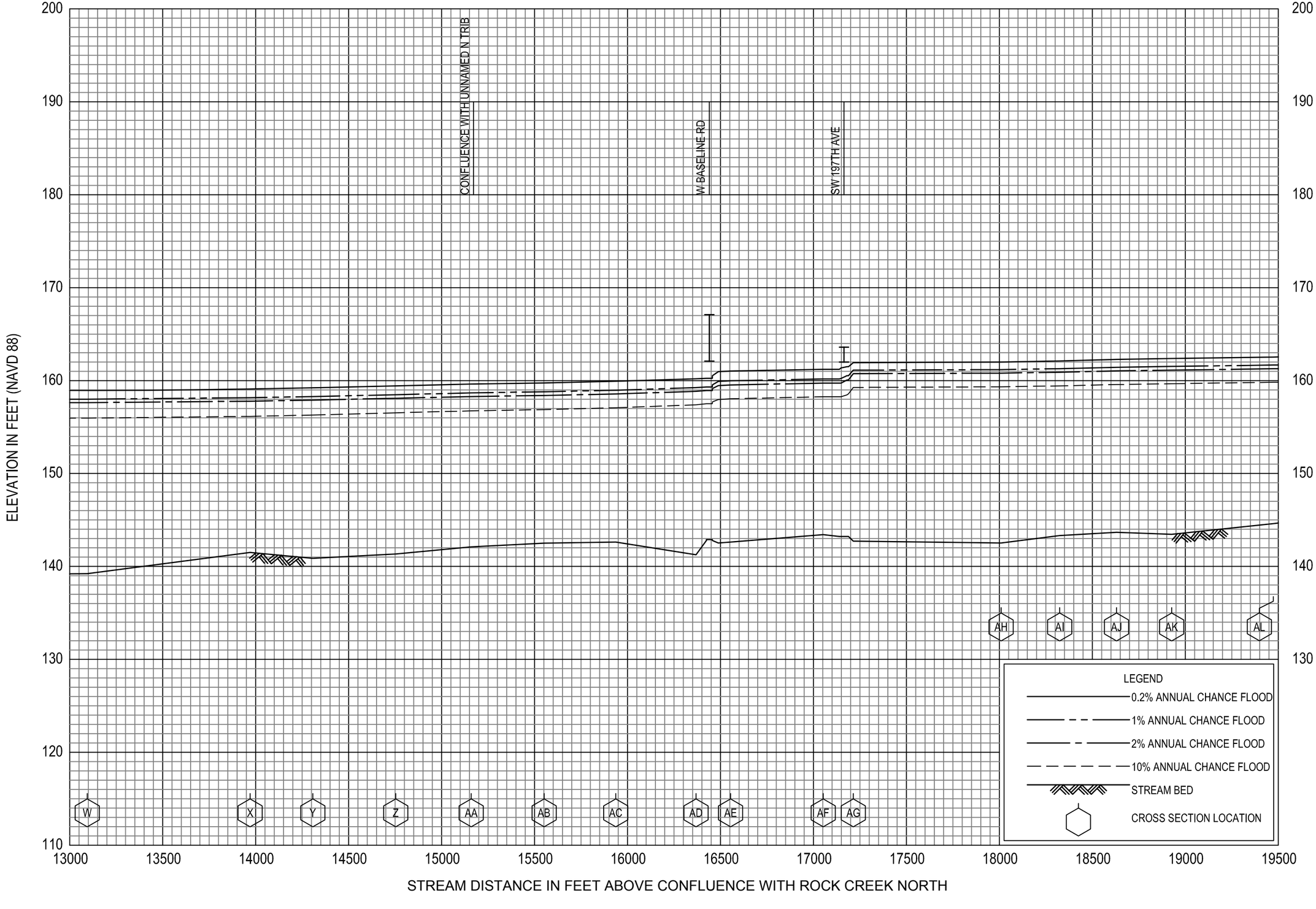
LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



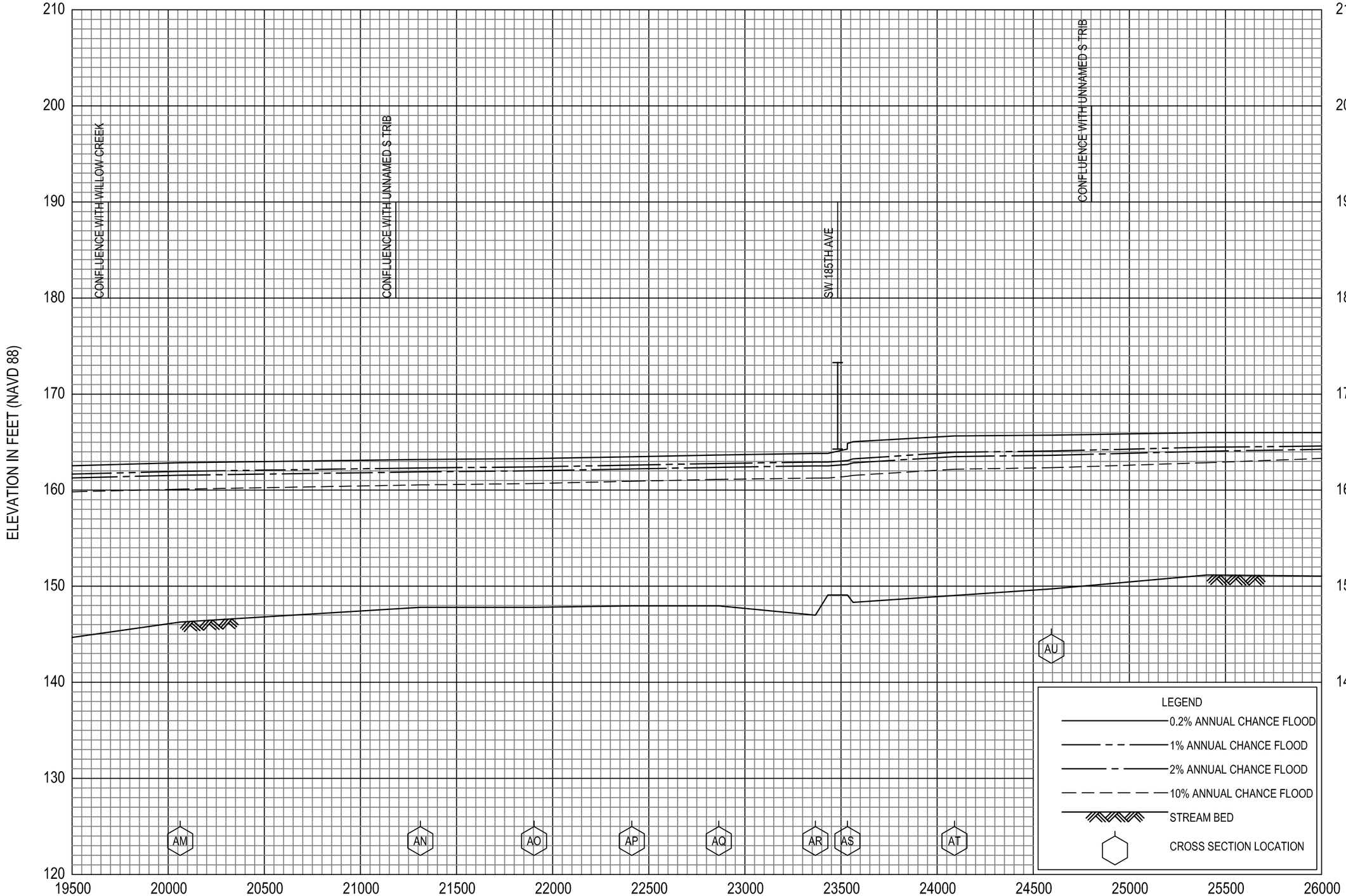
FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

06P



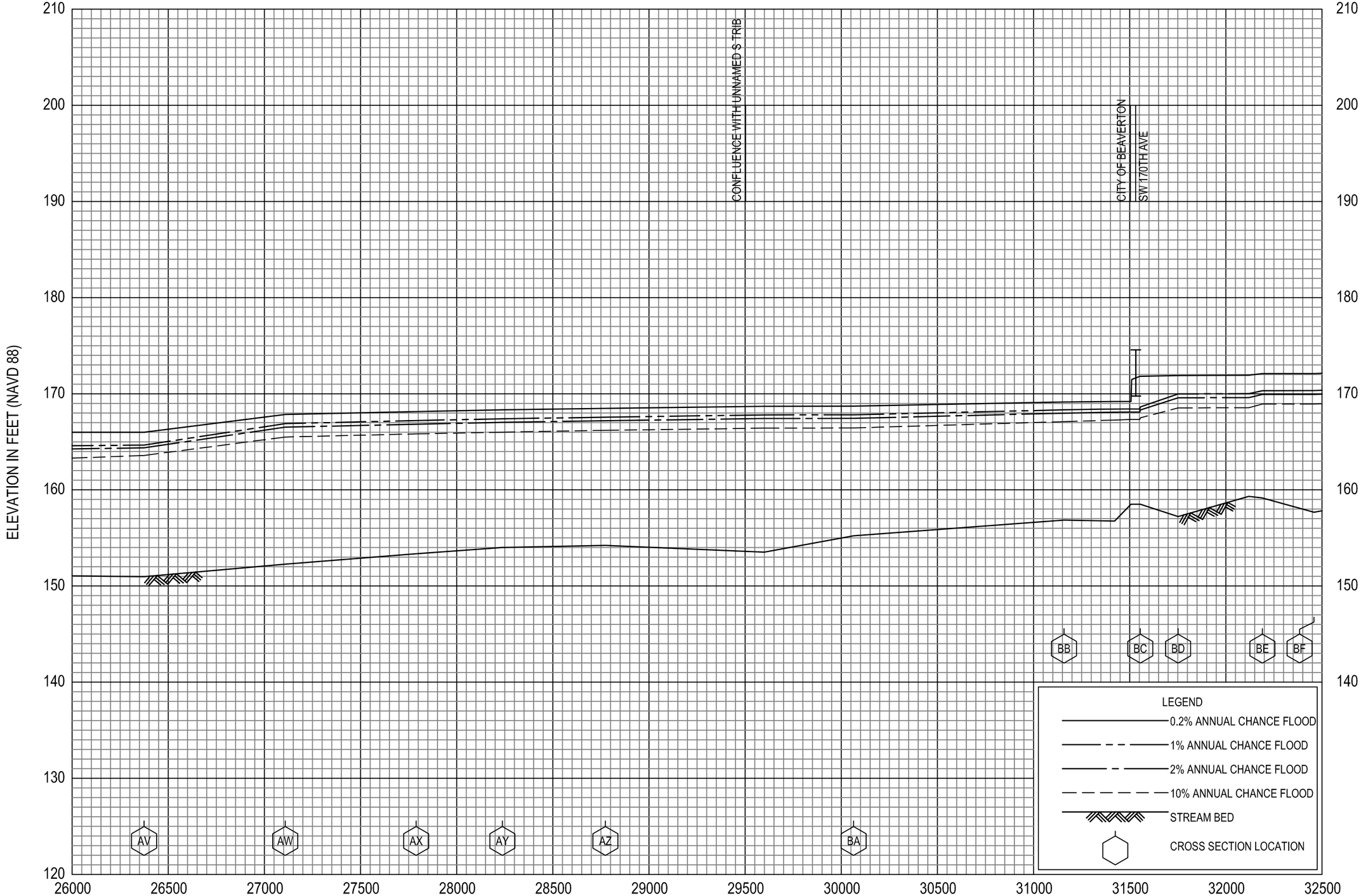
FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

07P



FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

08P

FLOOD PROFILES

BEAVERTON CREEK

ELEVATION IN FEET (NAVD 88)

220
210
200
190
180
170
160
150
140
130

CONFLUENCE WITH CEDAR MILL
FOOTBRIDGE
CONFLUENCE WITH UNNAMED S TRIB
CONFLUENCE WITH UNNAMED S TRIB
SW MILLIKAN BLVD
P & W RAILROAD
FOOTPATH
CONFLUENCE WITH SOUTH JOHNSON CREEK

BG BH BI BJ BK BL BM BN BO BP BQ BR BS

LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION

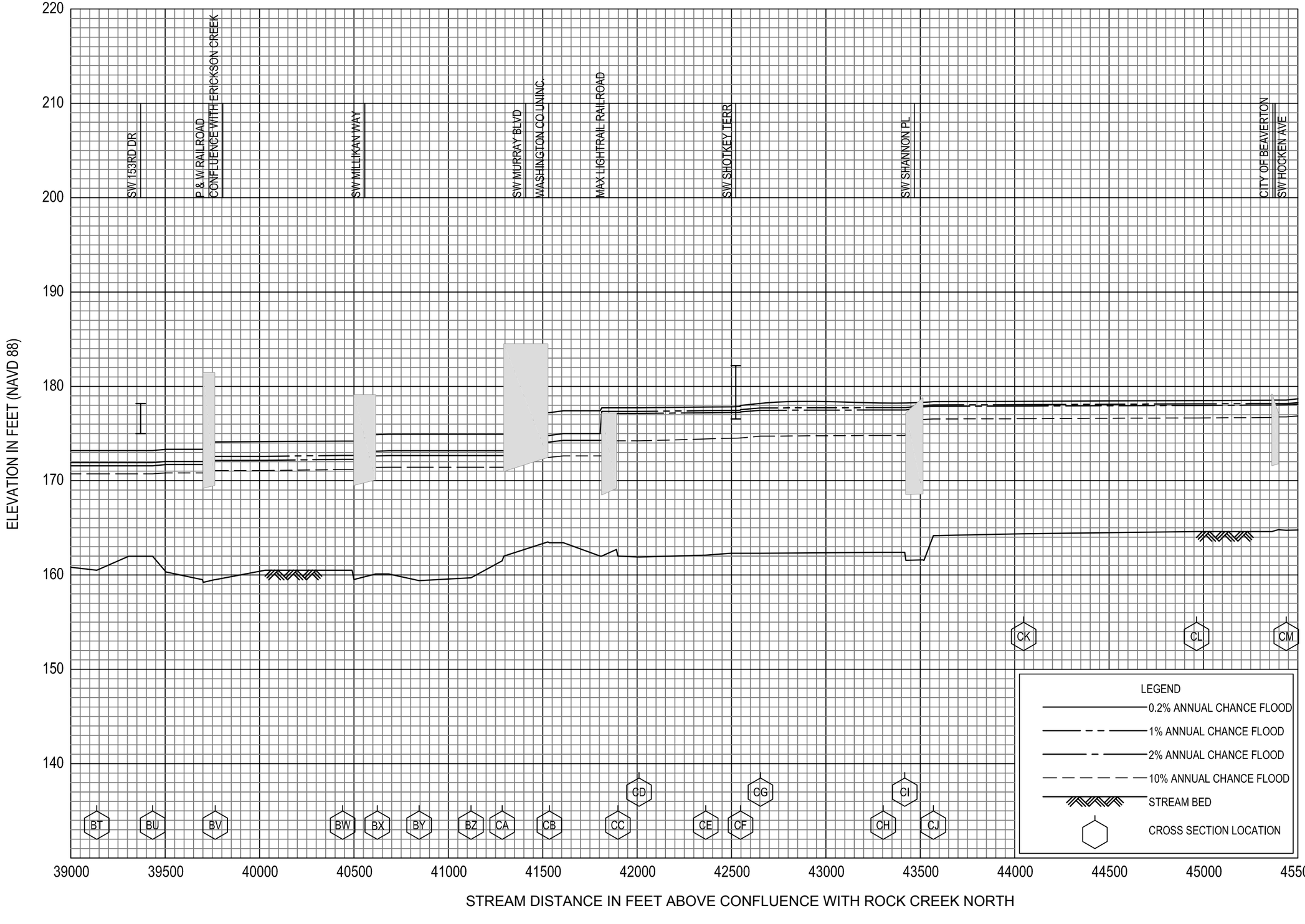
32500 33000 33500 34000 34500 35000 35500 36000 36500 37000 37500 38000 38500 39000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

09P

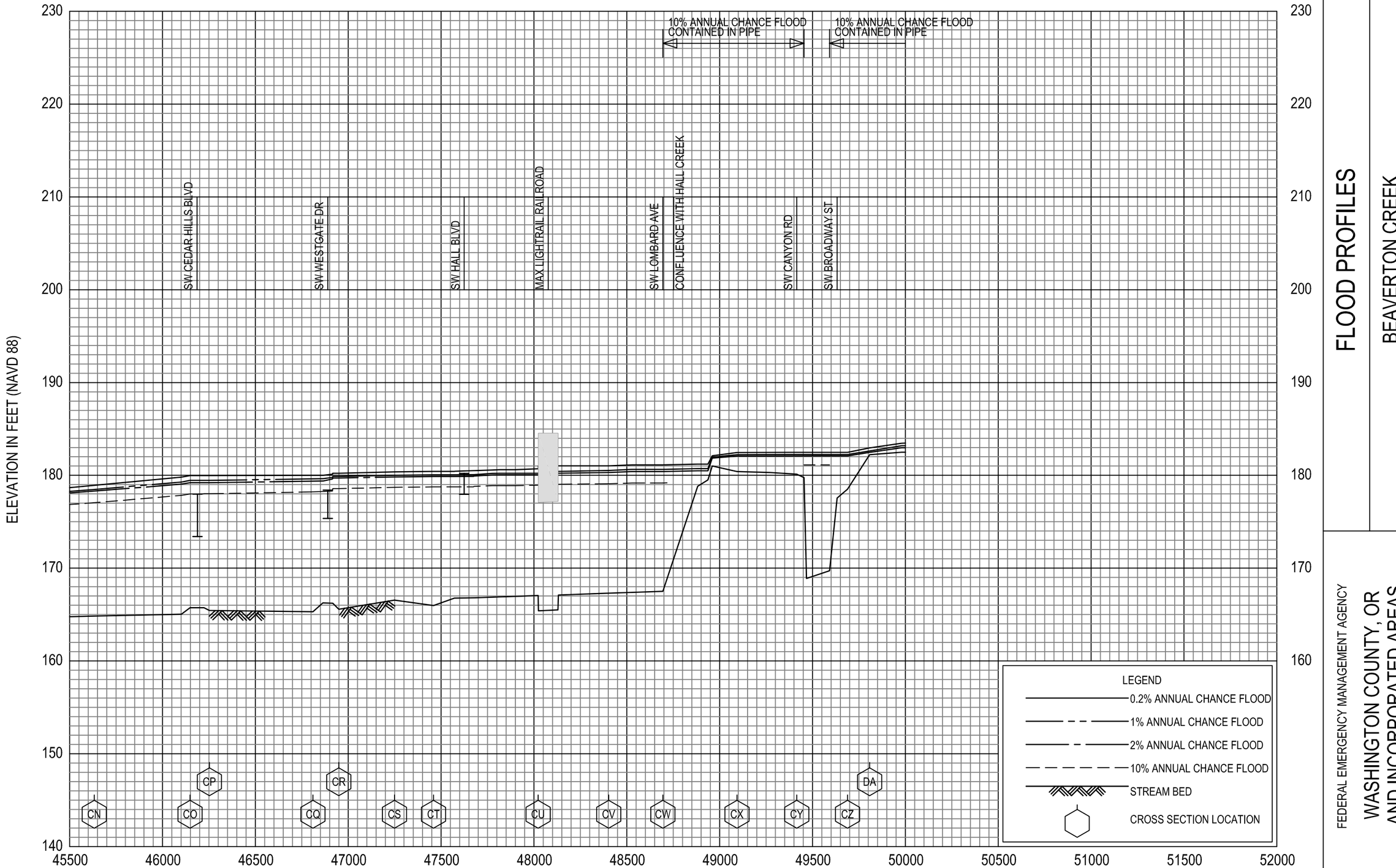


FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

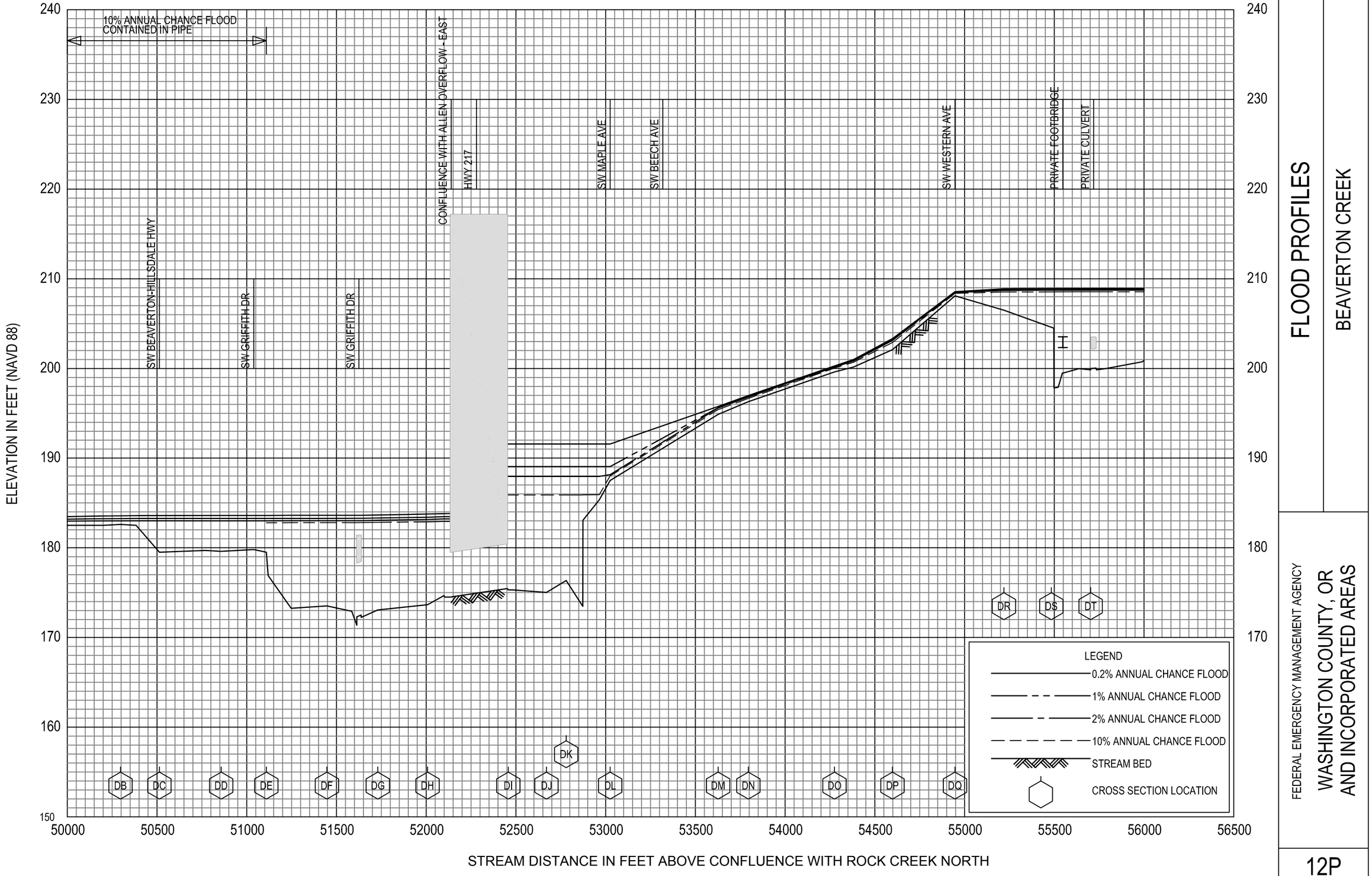


FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



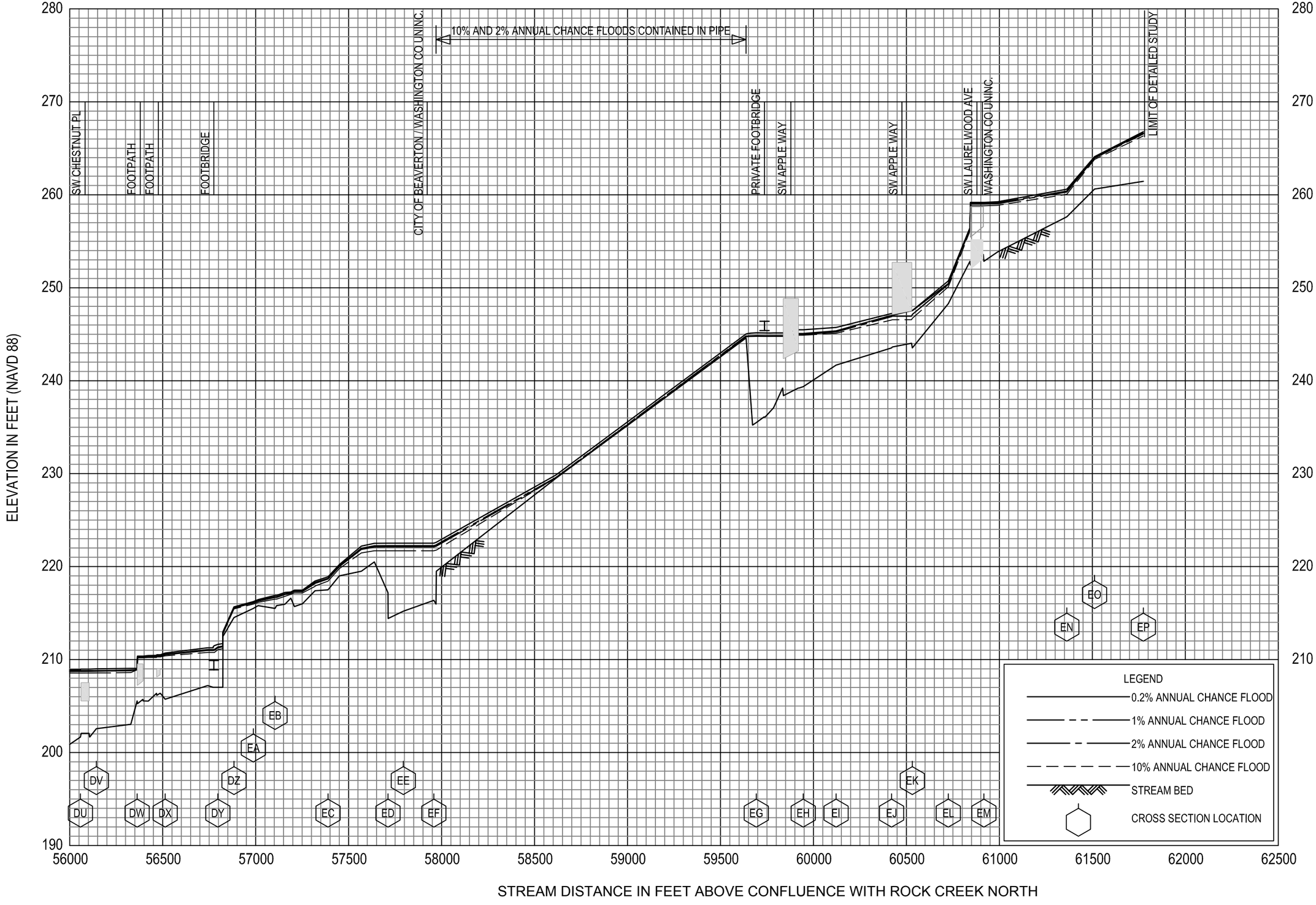
FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

12P

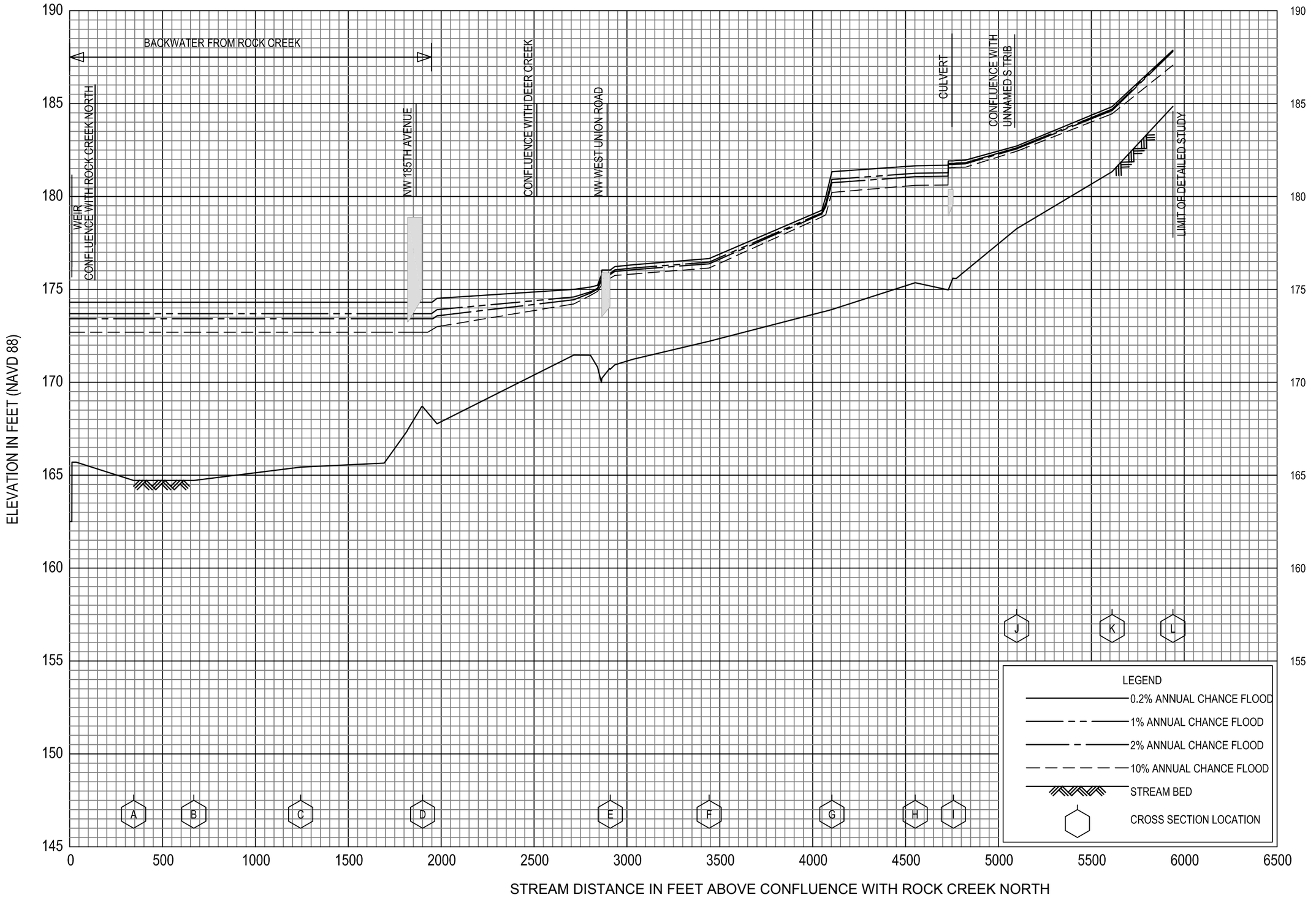


FLOOD PROFILES

BEAVERTON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

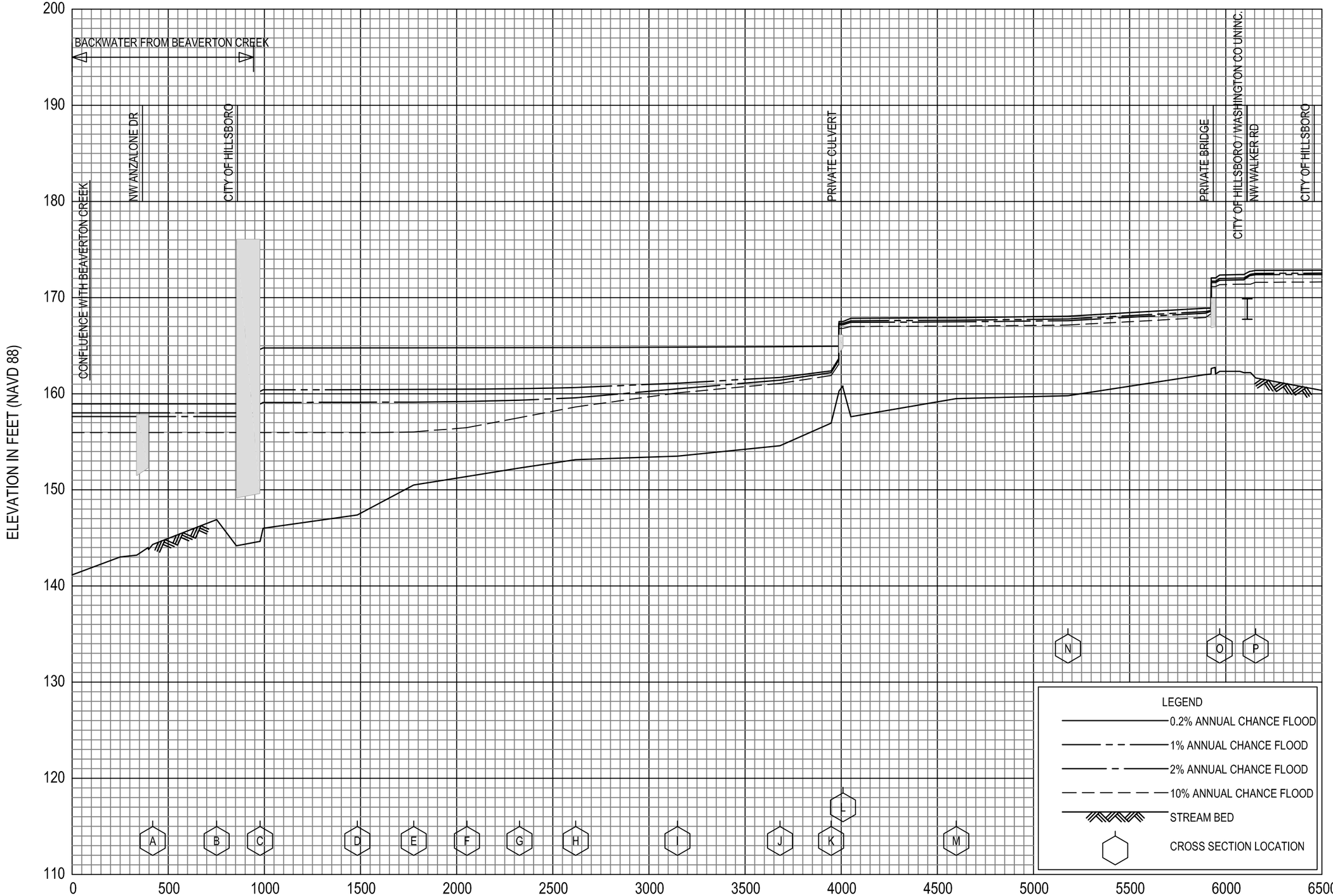


FLOOD PROFILES

BETHANY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

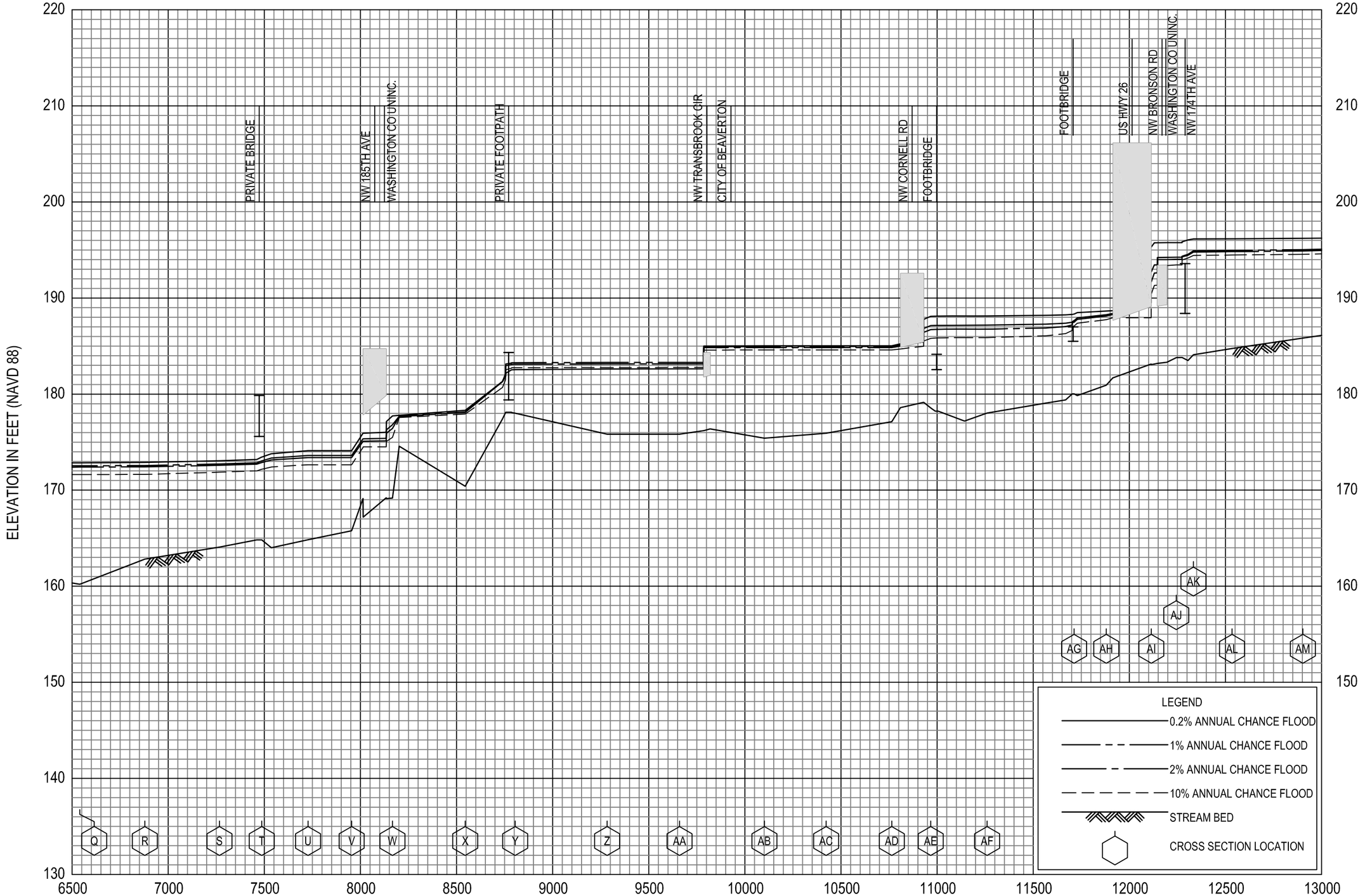
15P

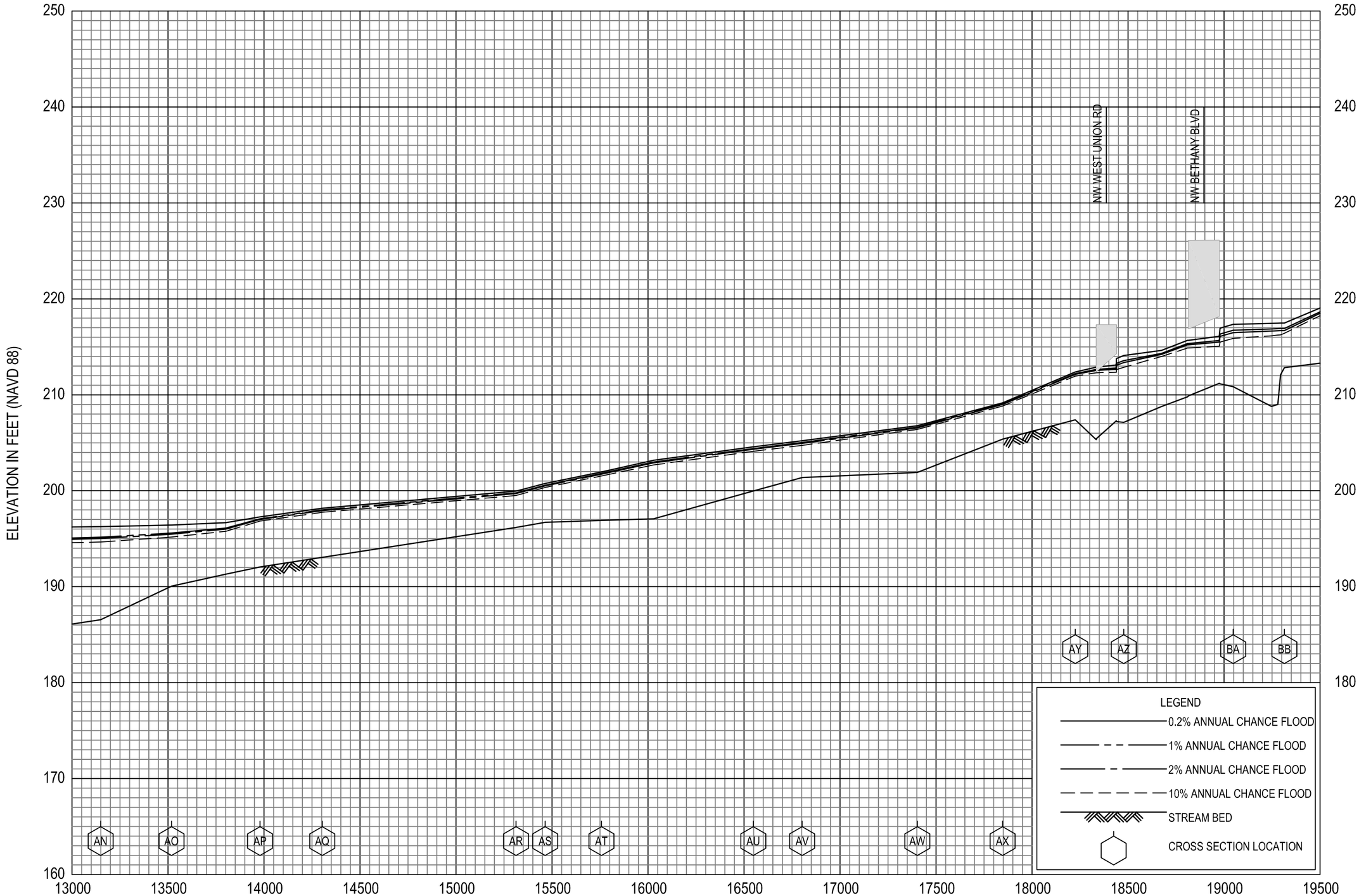
FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



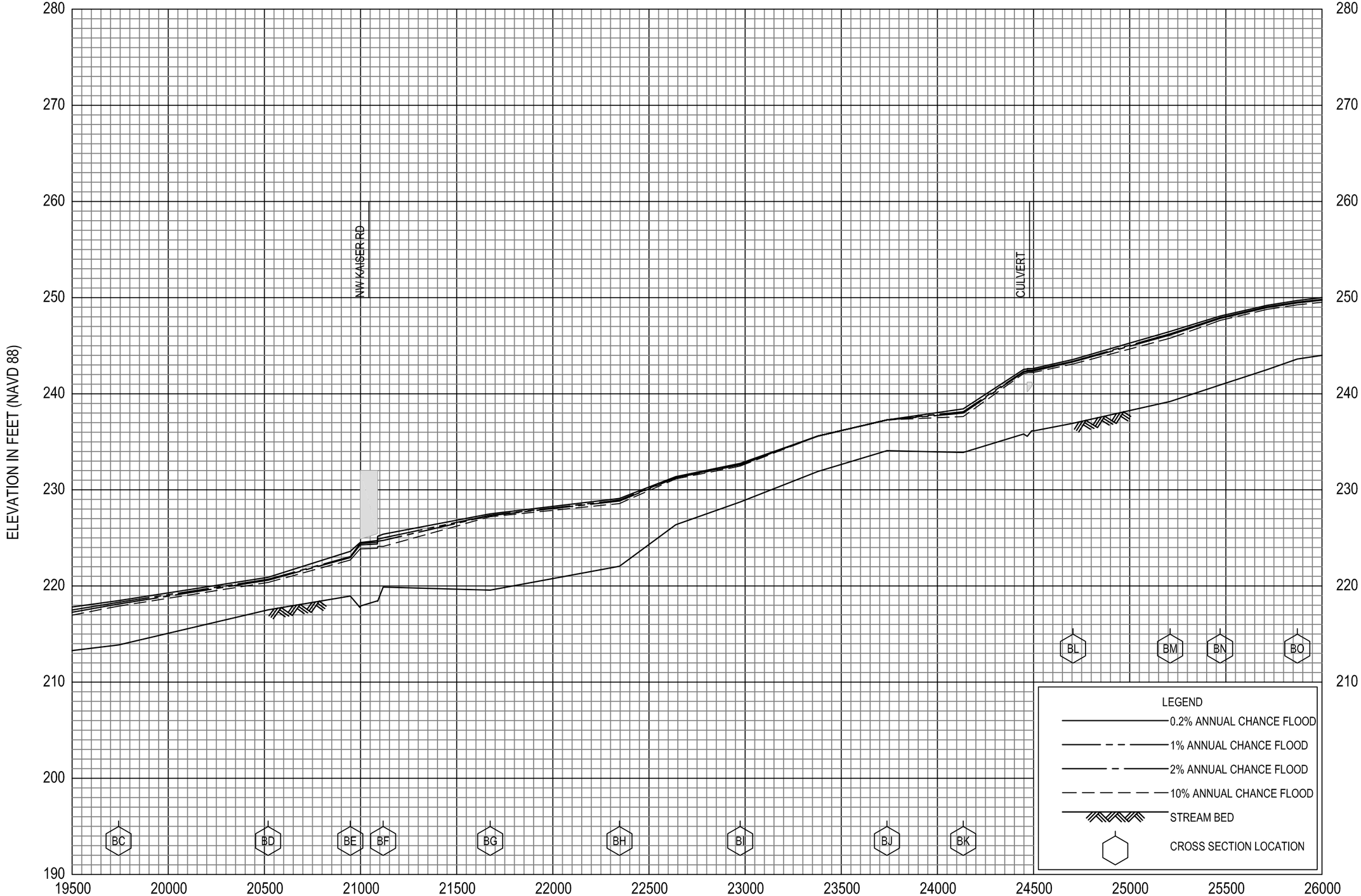


FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

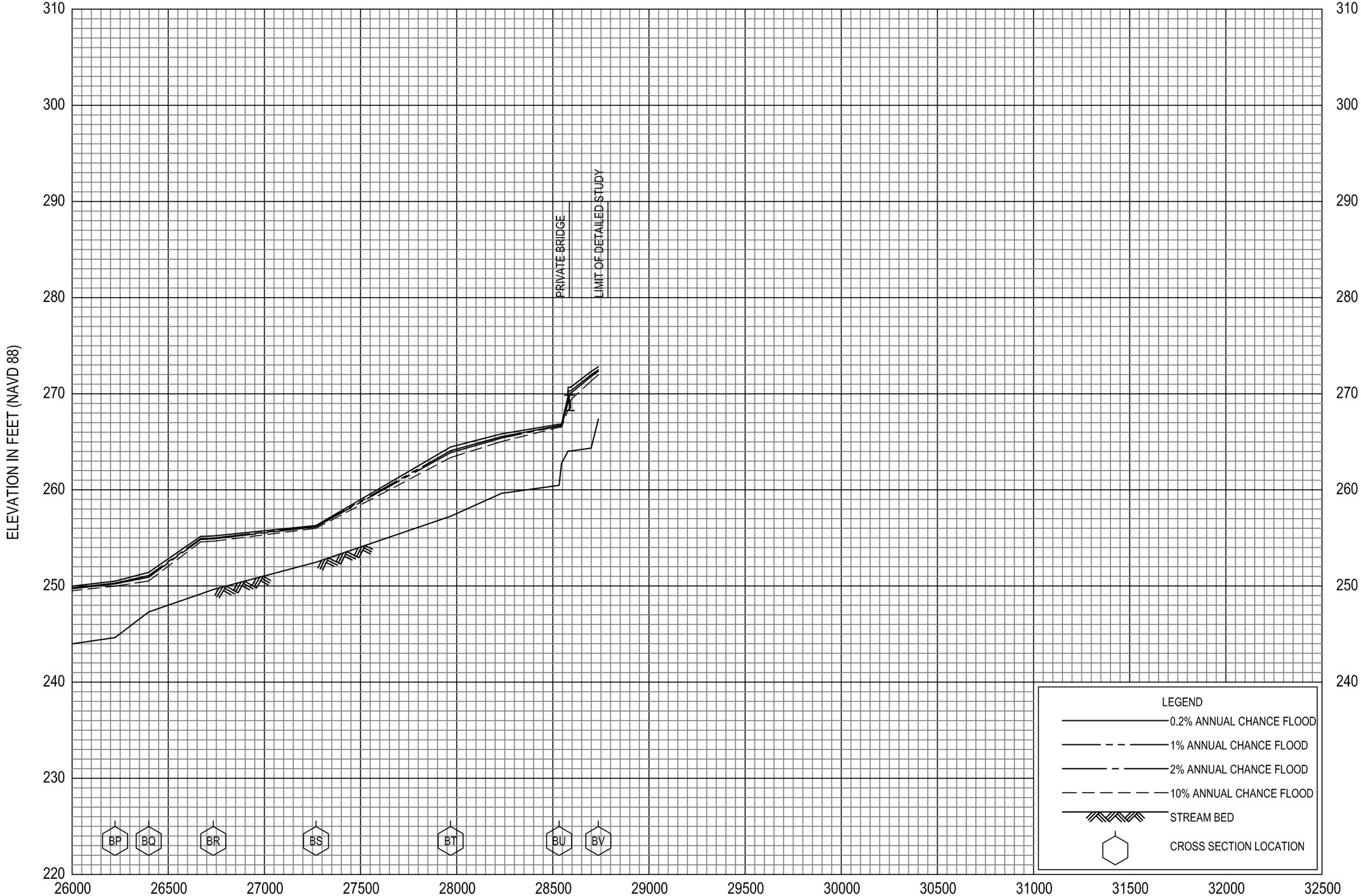


FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

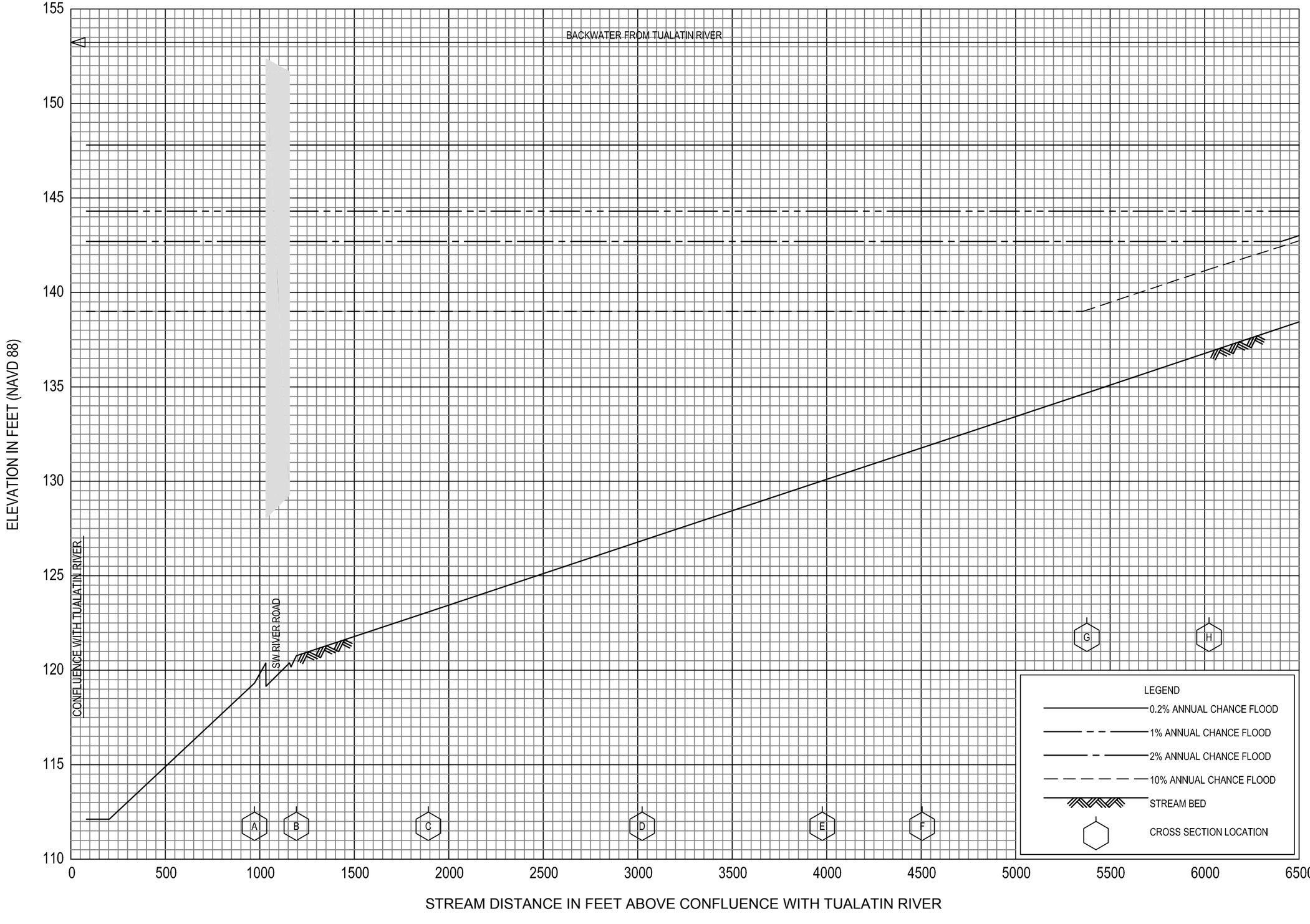


FLOOD PROFILES

BRONSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

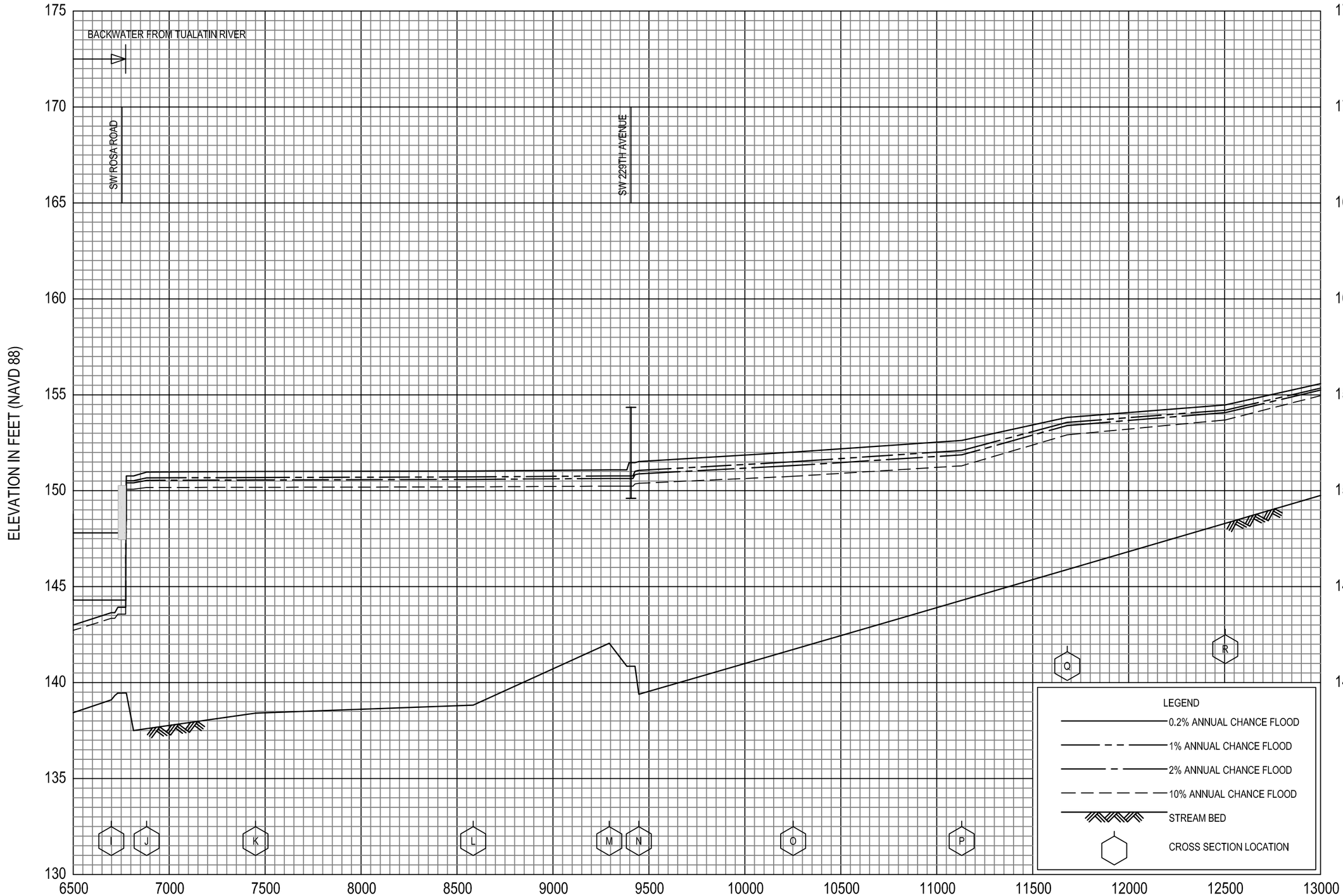


FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

ELEVATION IN FEET (NAVD 88)

185
180
175
170
165
160
155
150
145
140

13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH TUALATIN RIVER

SW 209TH AVENUE

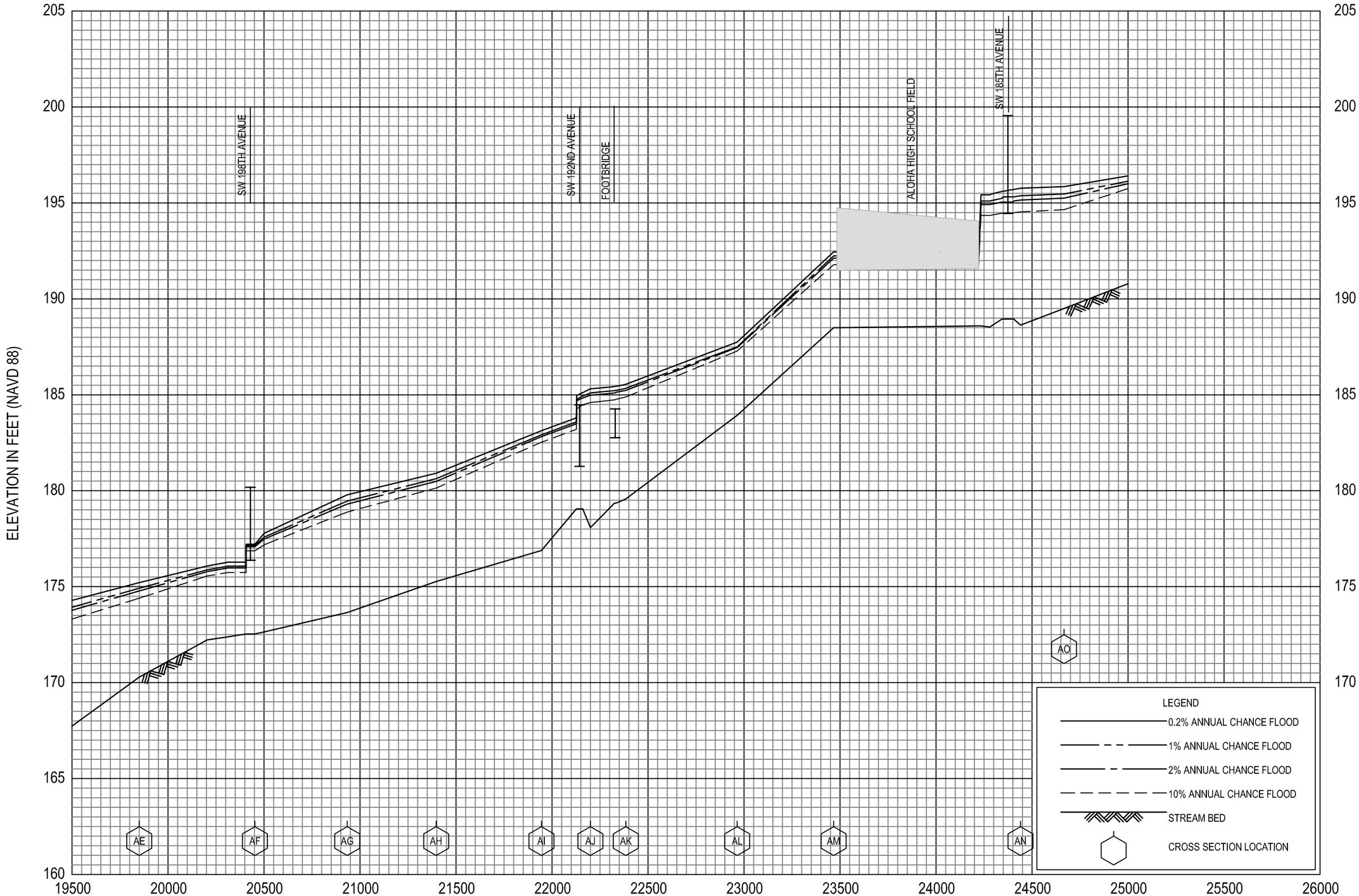
CONFLUENCE WITH UNNAMED S.TRIB

ALOHA HIGH SCHOOL FOOTBRIDGE

S T U V W X Y Z AA AB AC AD

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

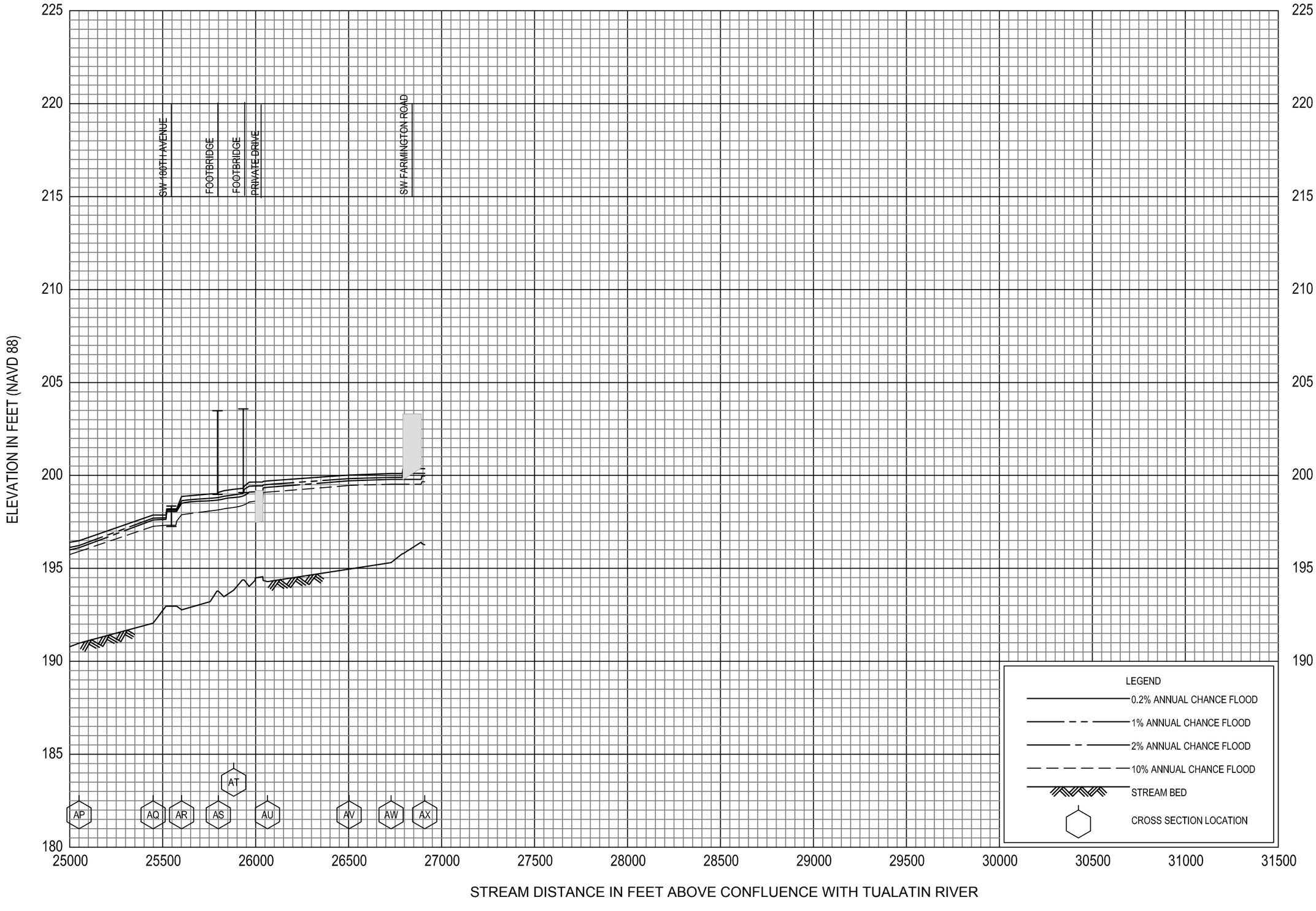


FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

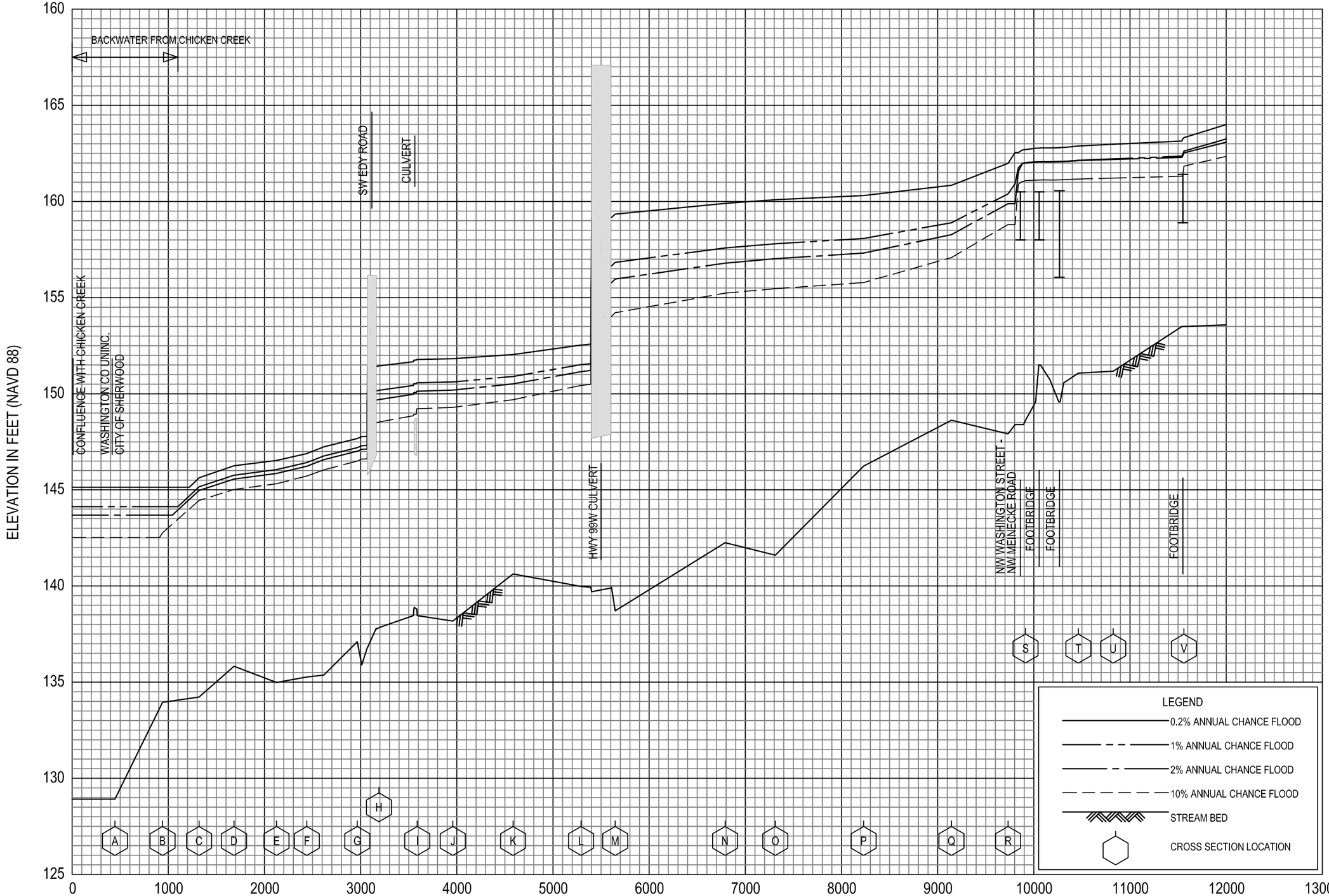


FLOOD PROFILES

BUTTERNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



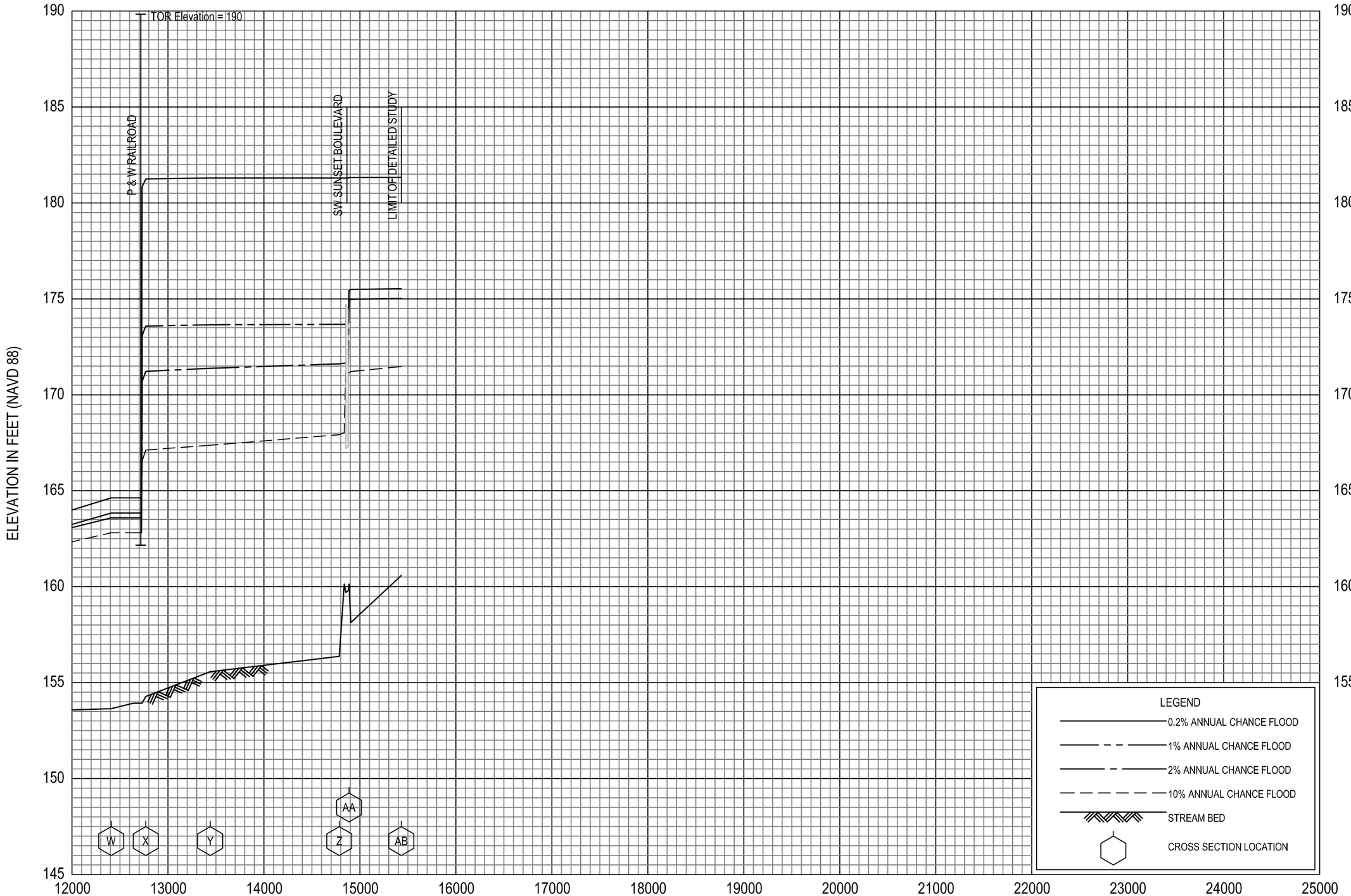
FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

25P

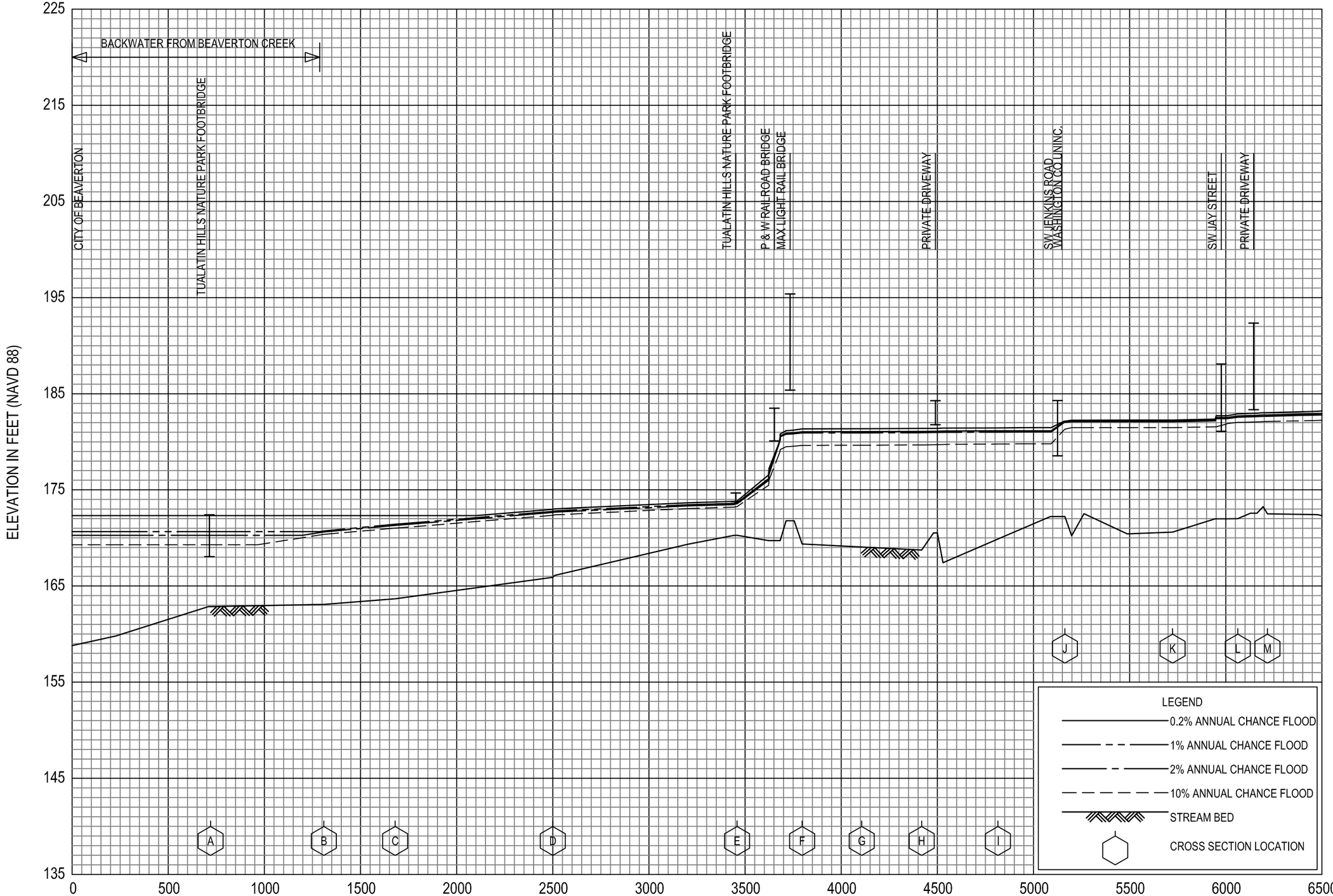


FLOOD PROFILES

CEDAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

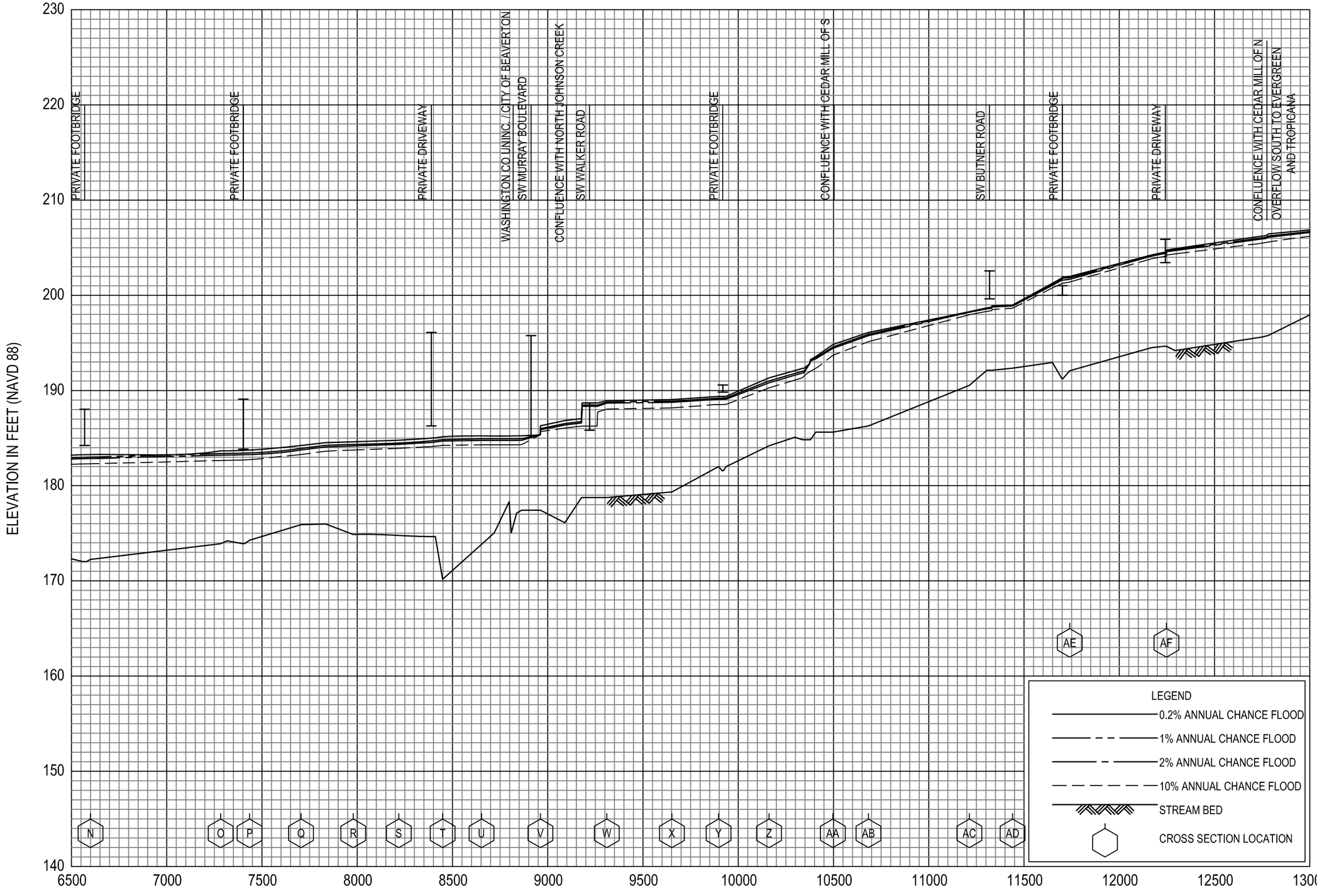


FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

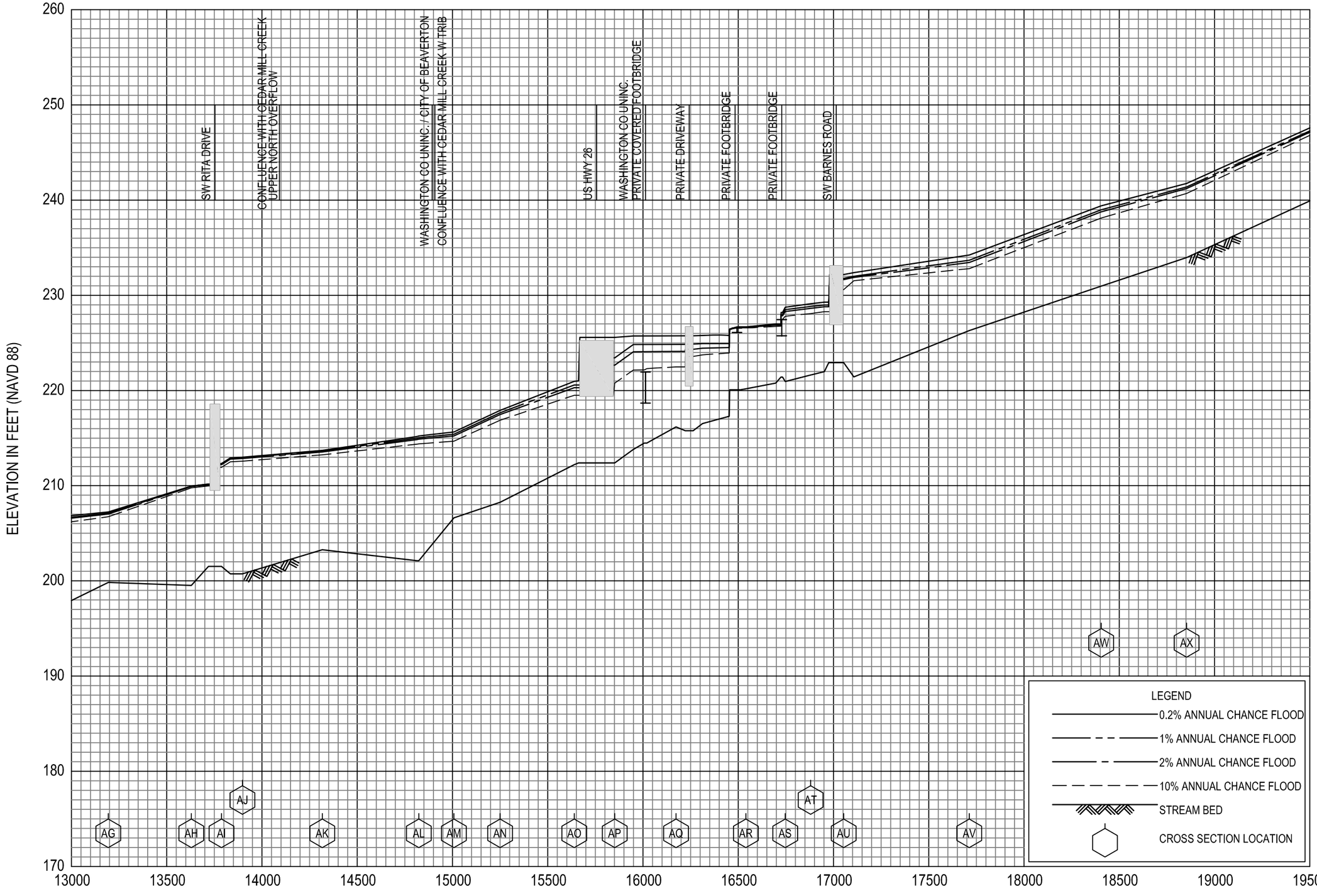


FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



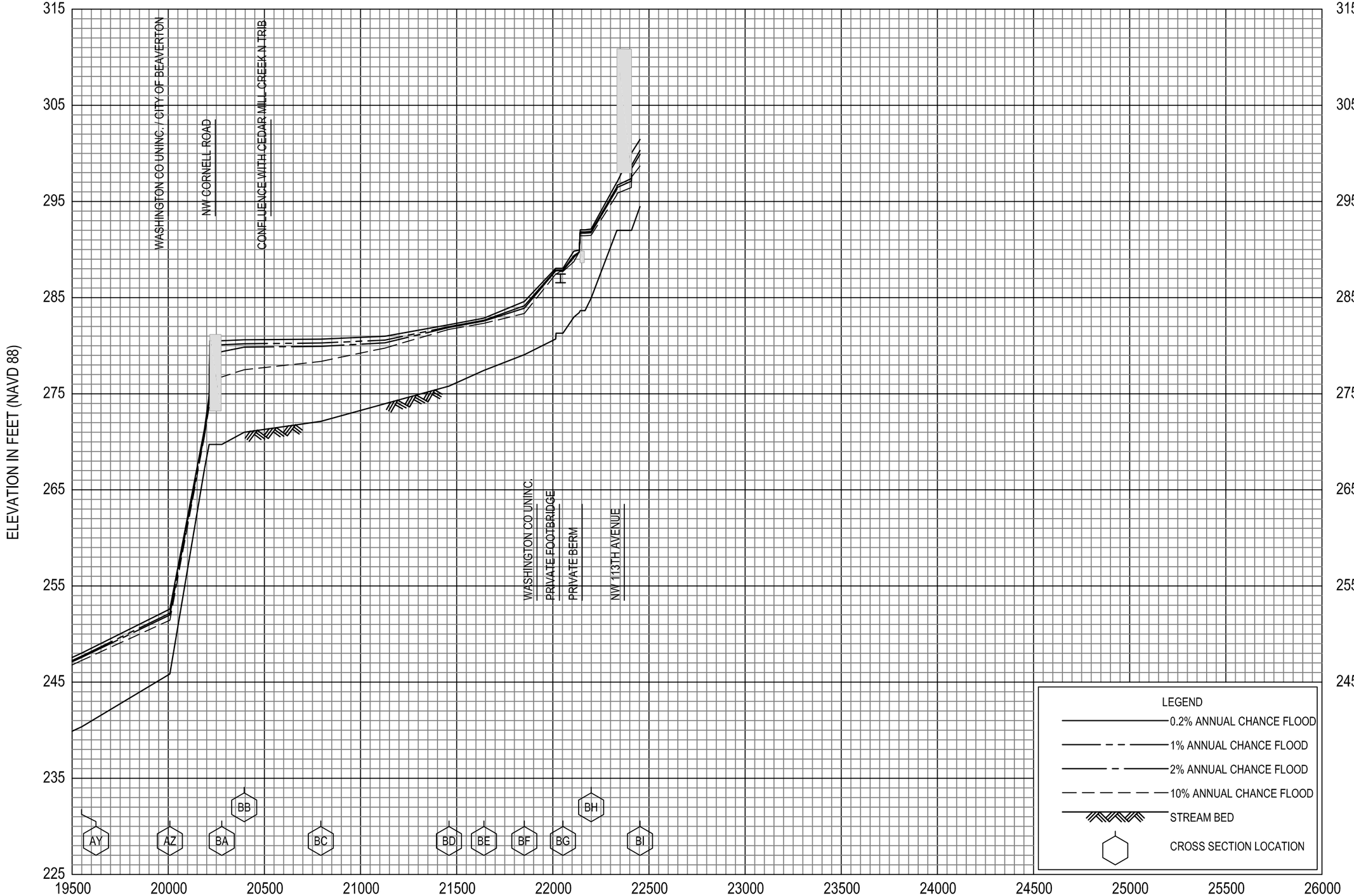
FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

29P

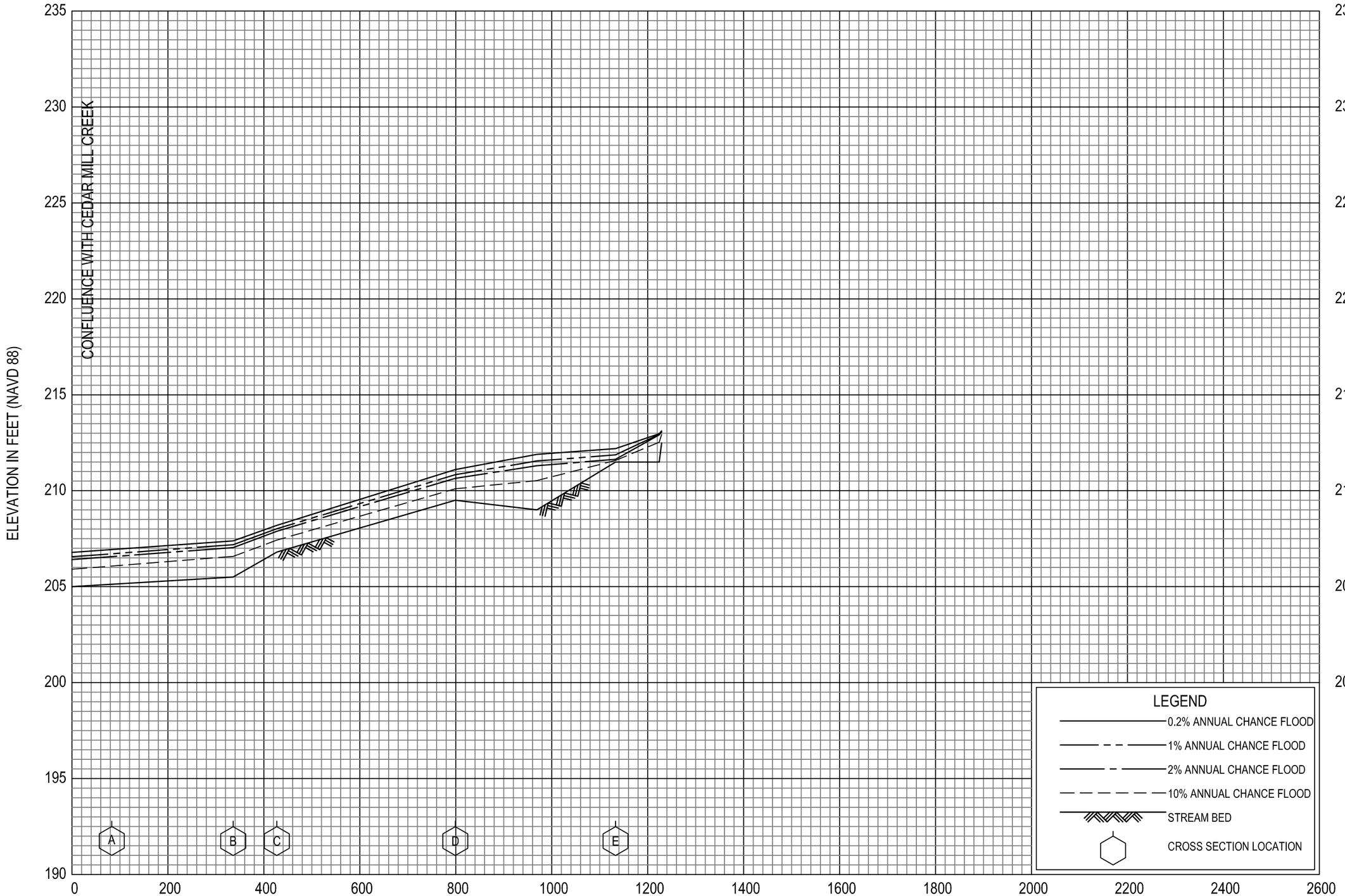


FLOOD PROFILES

CEDAR MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

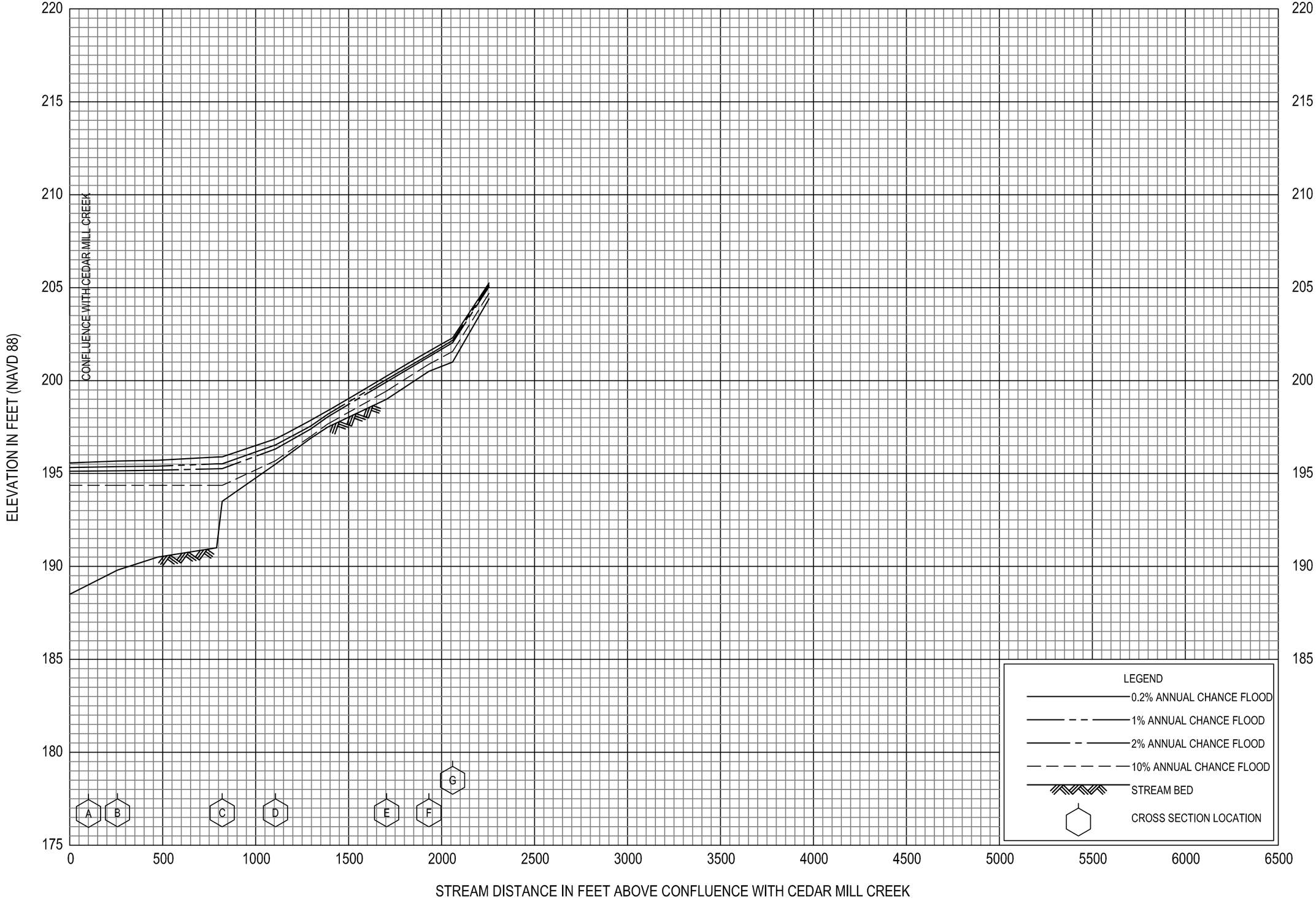


FLOOD PROFILES

CEDAR MILL CREEK - NORTH OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

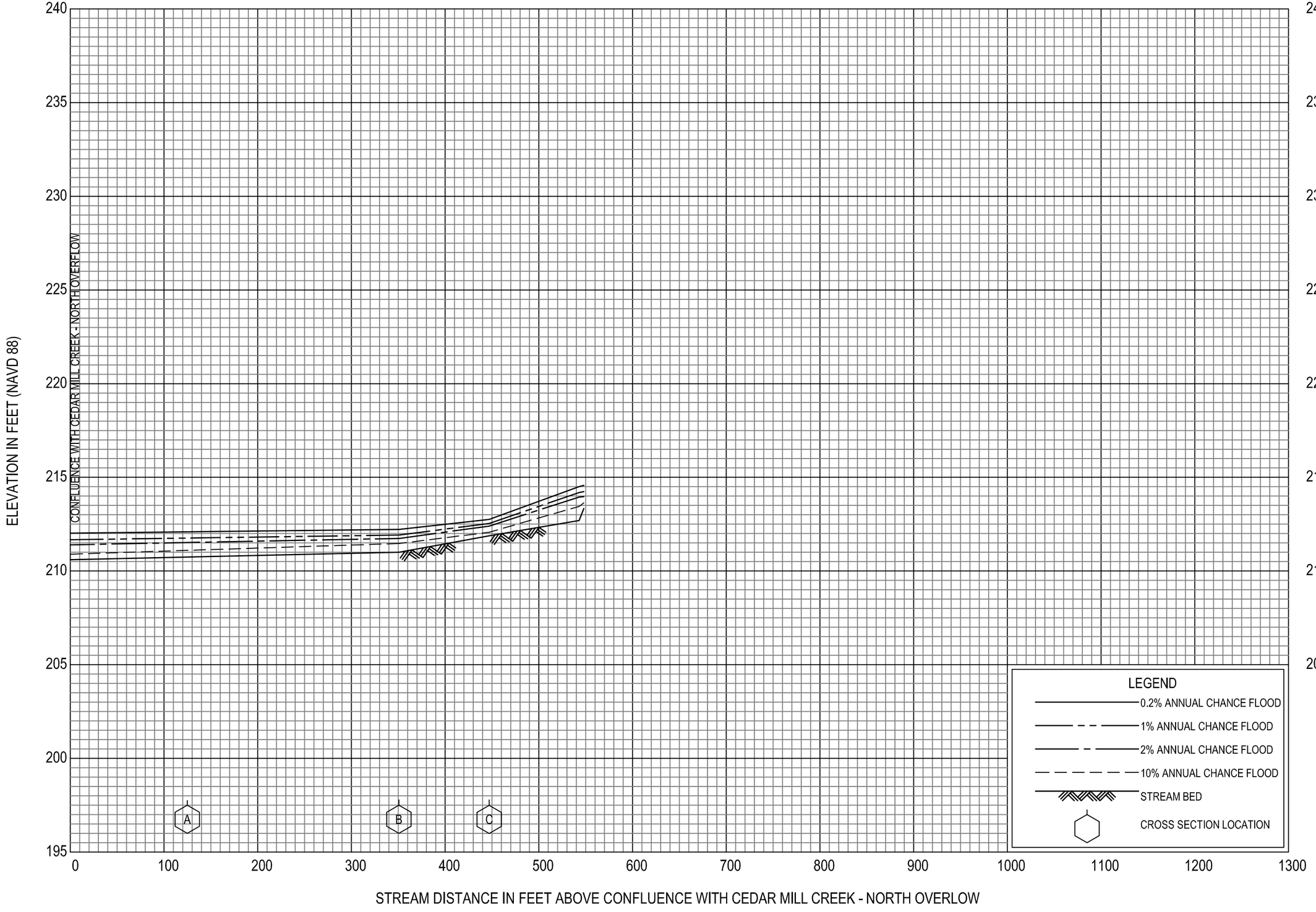


FLOOD PROFILES

CEDAR MILL CREEK - SOUTH OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



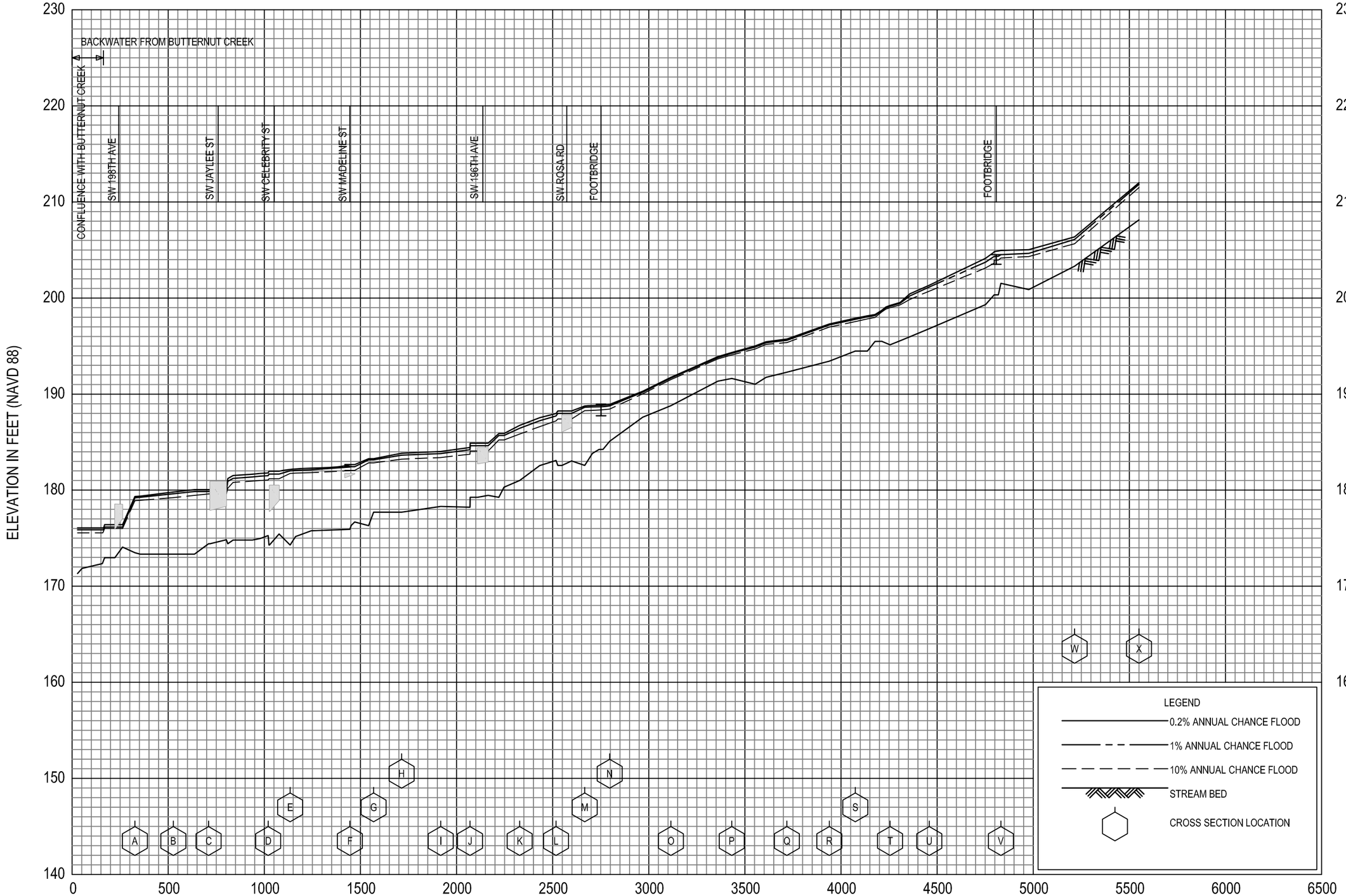
FLOOD PROFILES

CEDAR MILL CREEK - UPPER NORTH OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

33P

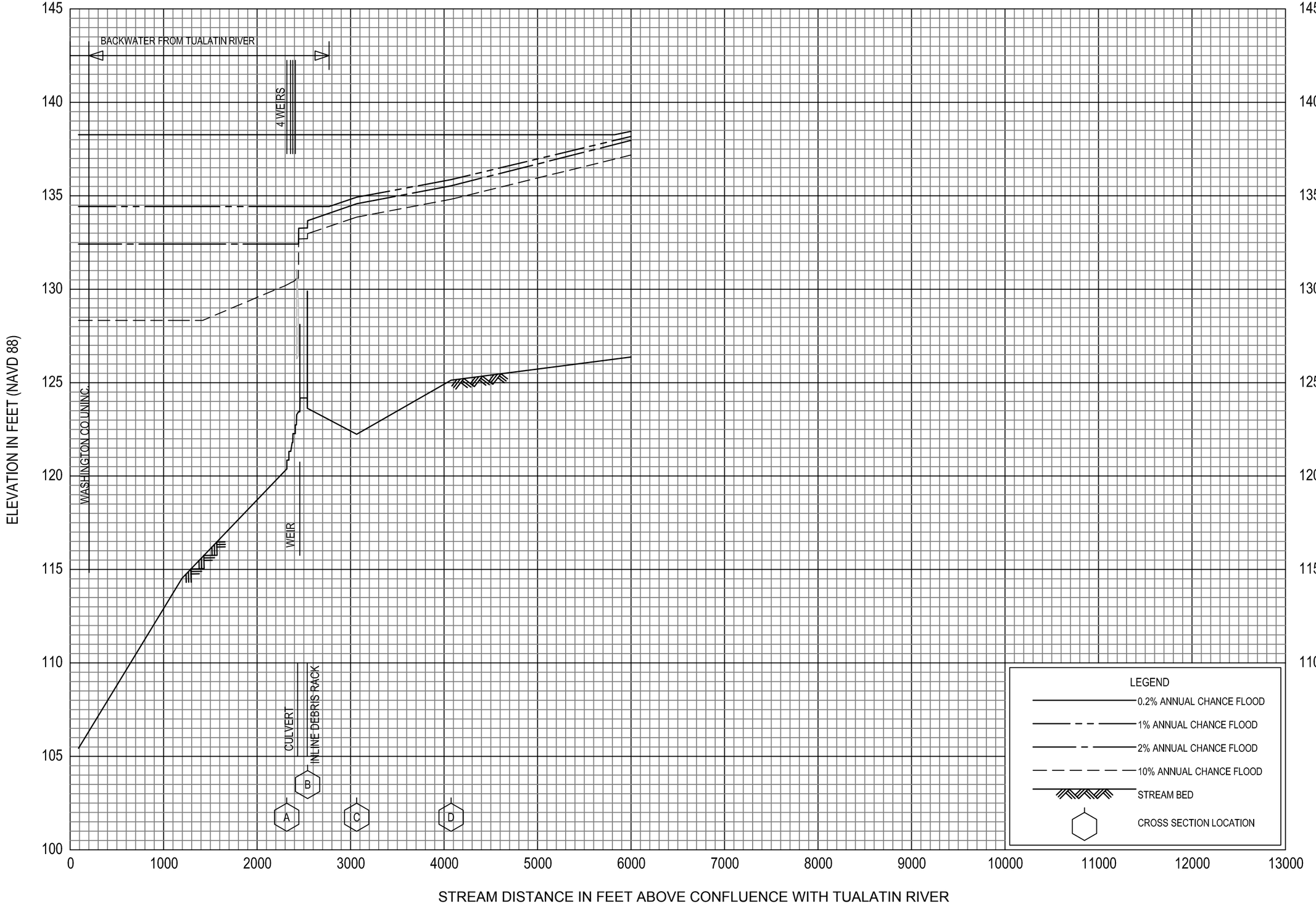


FLOOD PROFILES

CELEBRITY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



FLOOD PROFILES

CHICKEN CREEK

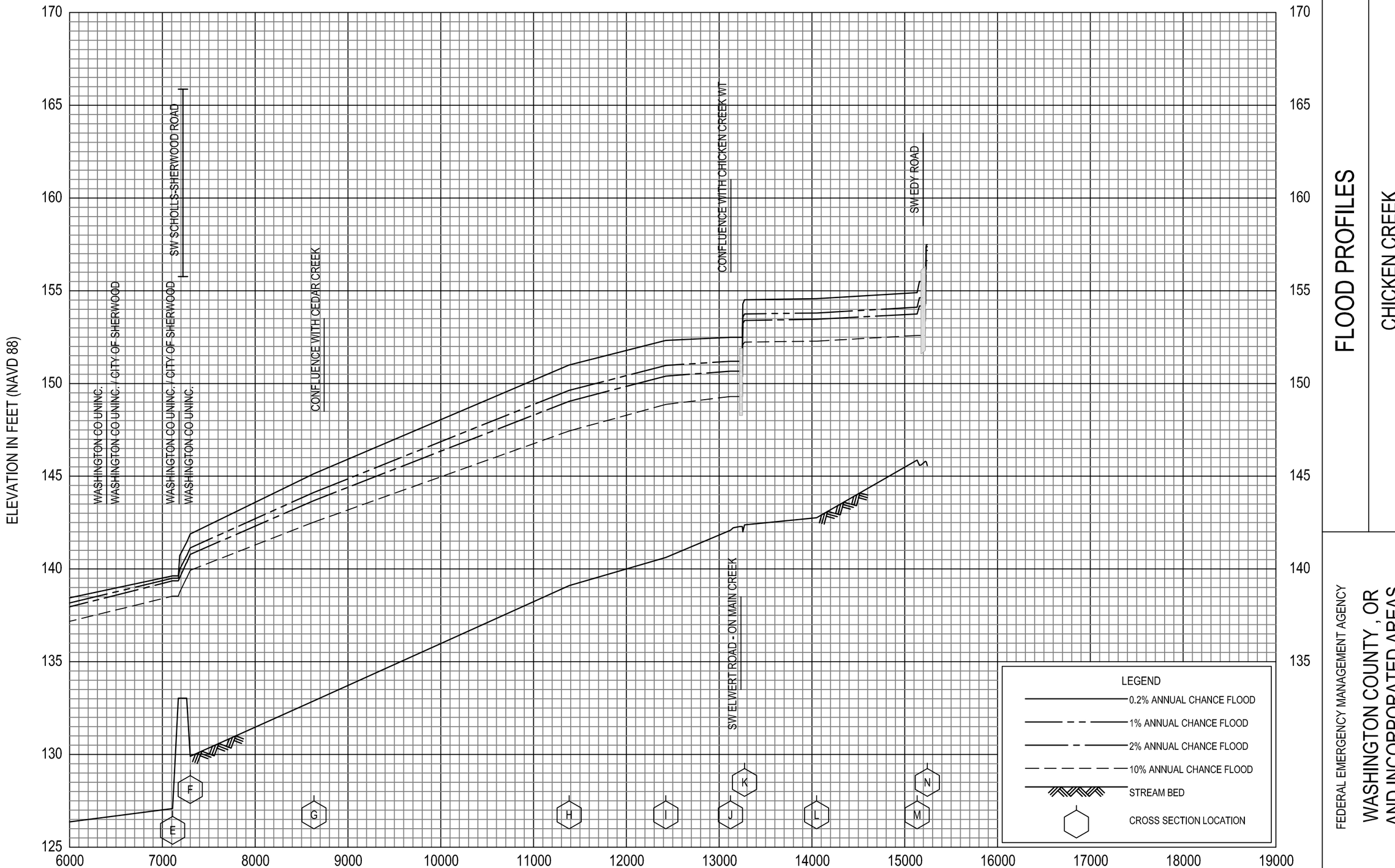
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WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

35P

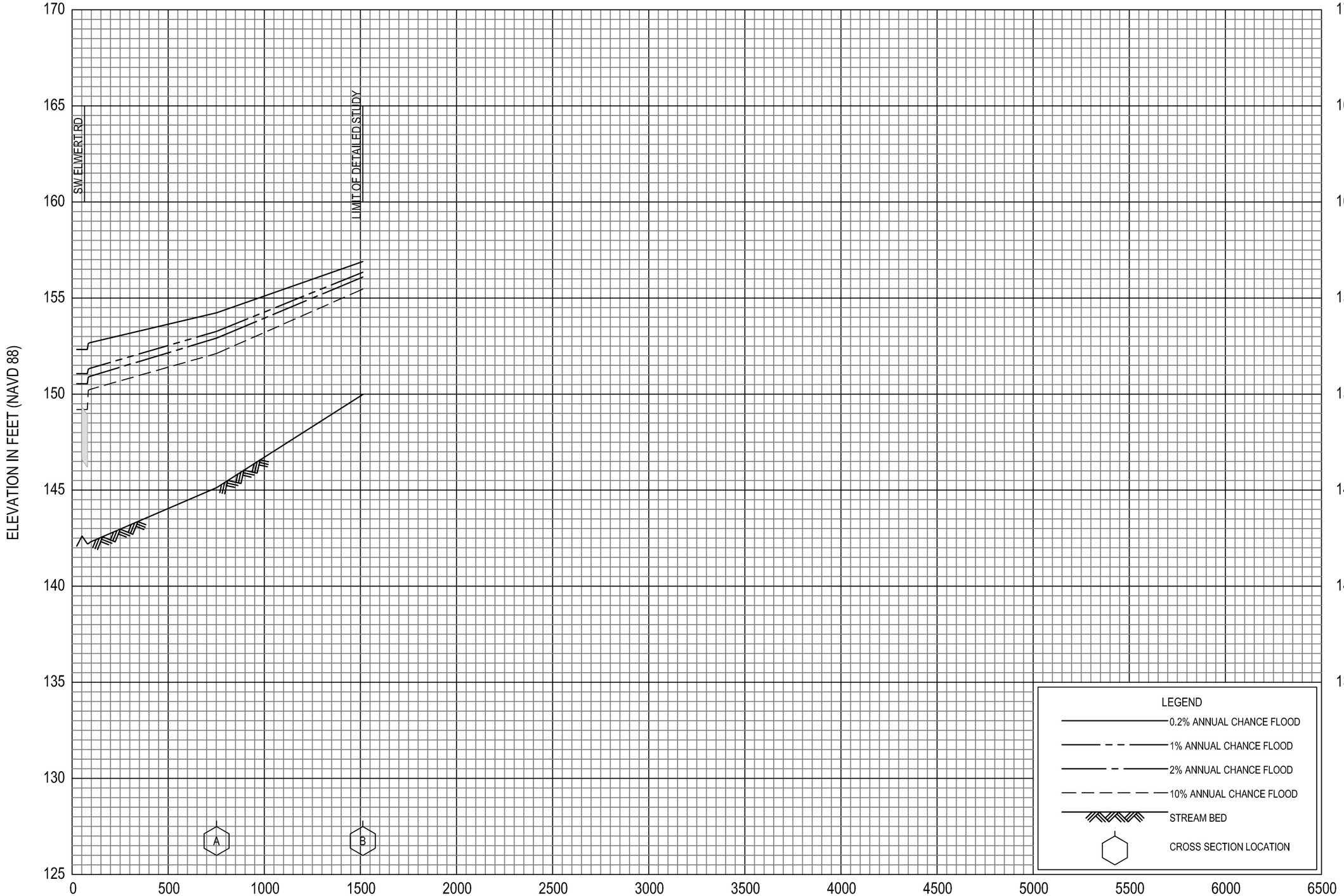
FLOOD PROFILES

CHICKEN CREEK



FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

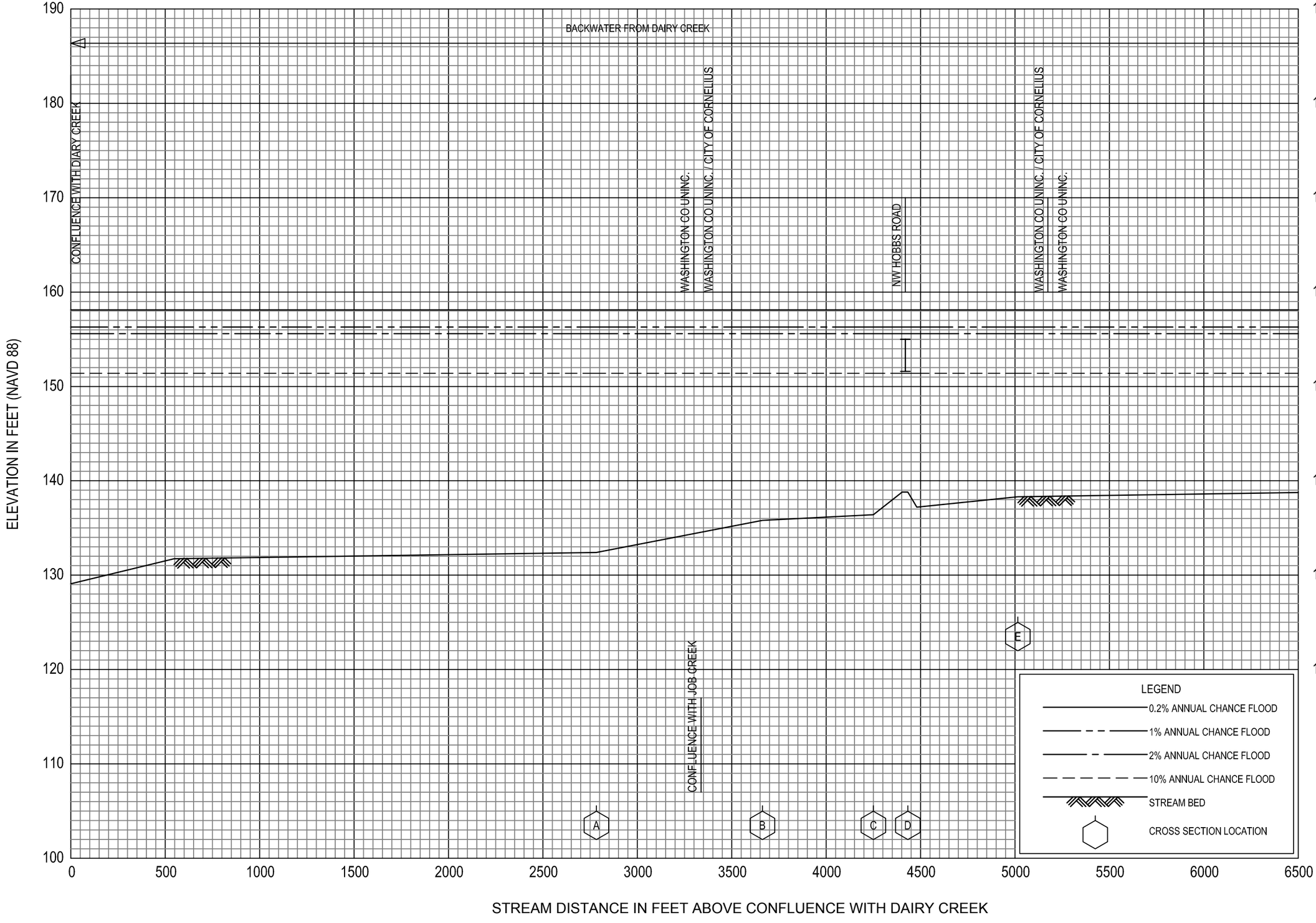


FLOOD PROFILES

CHICKEN CREEK - WEST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

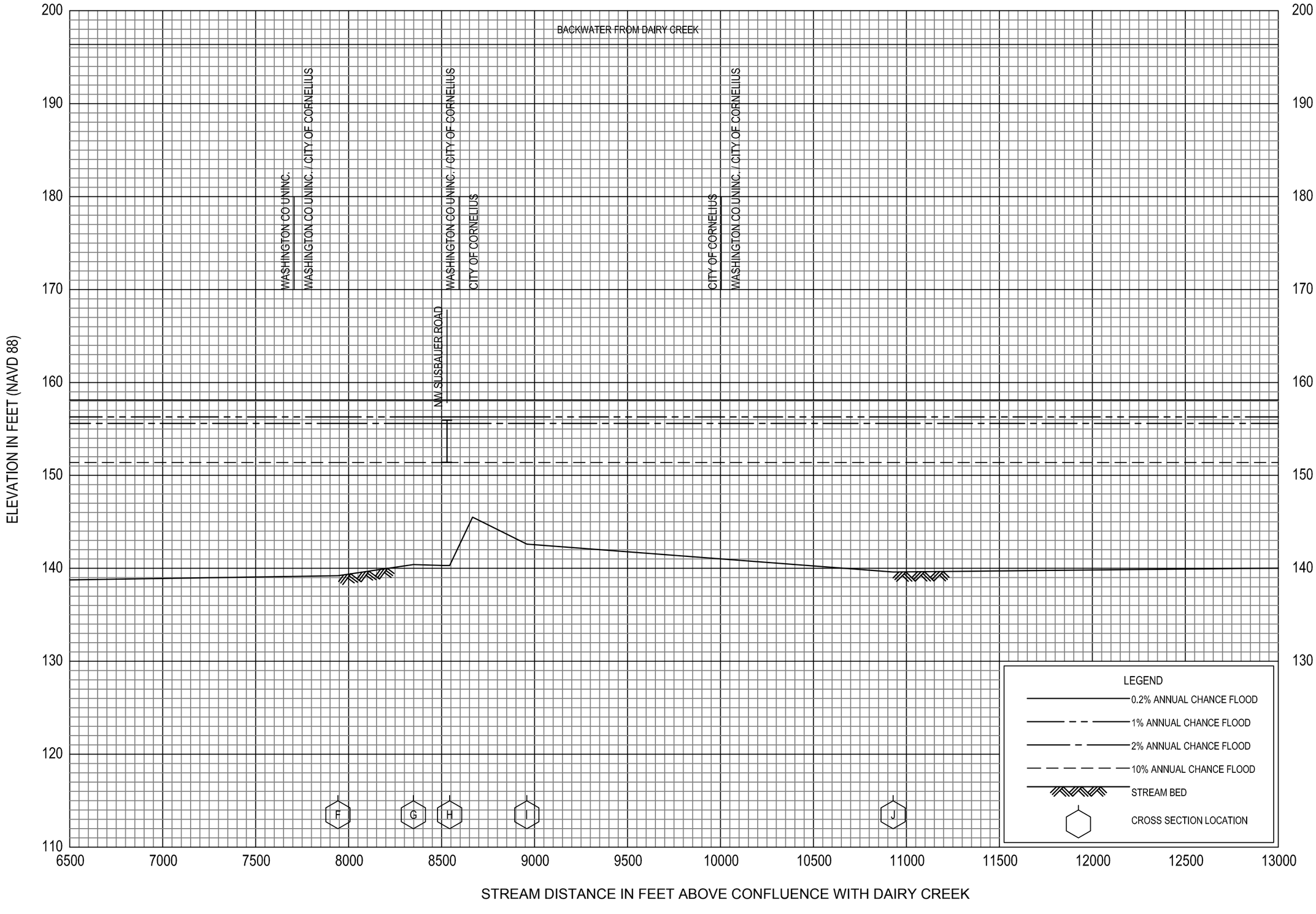


FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

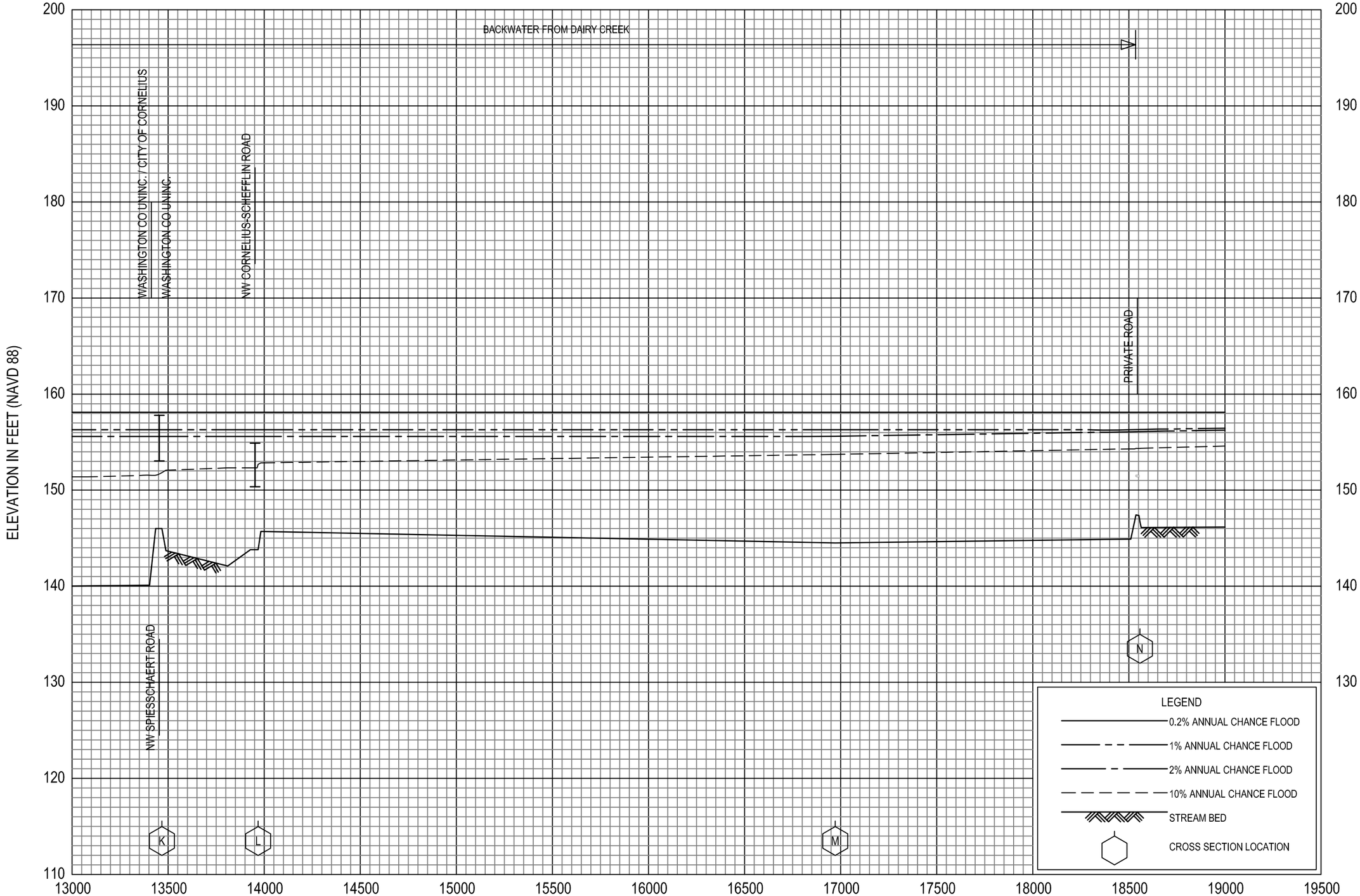


FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

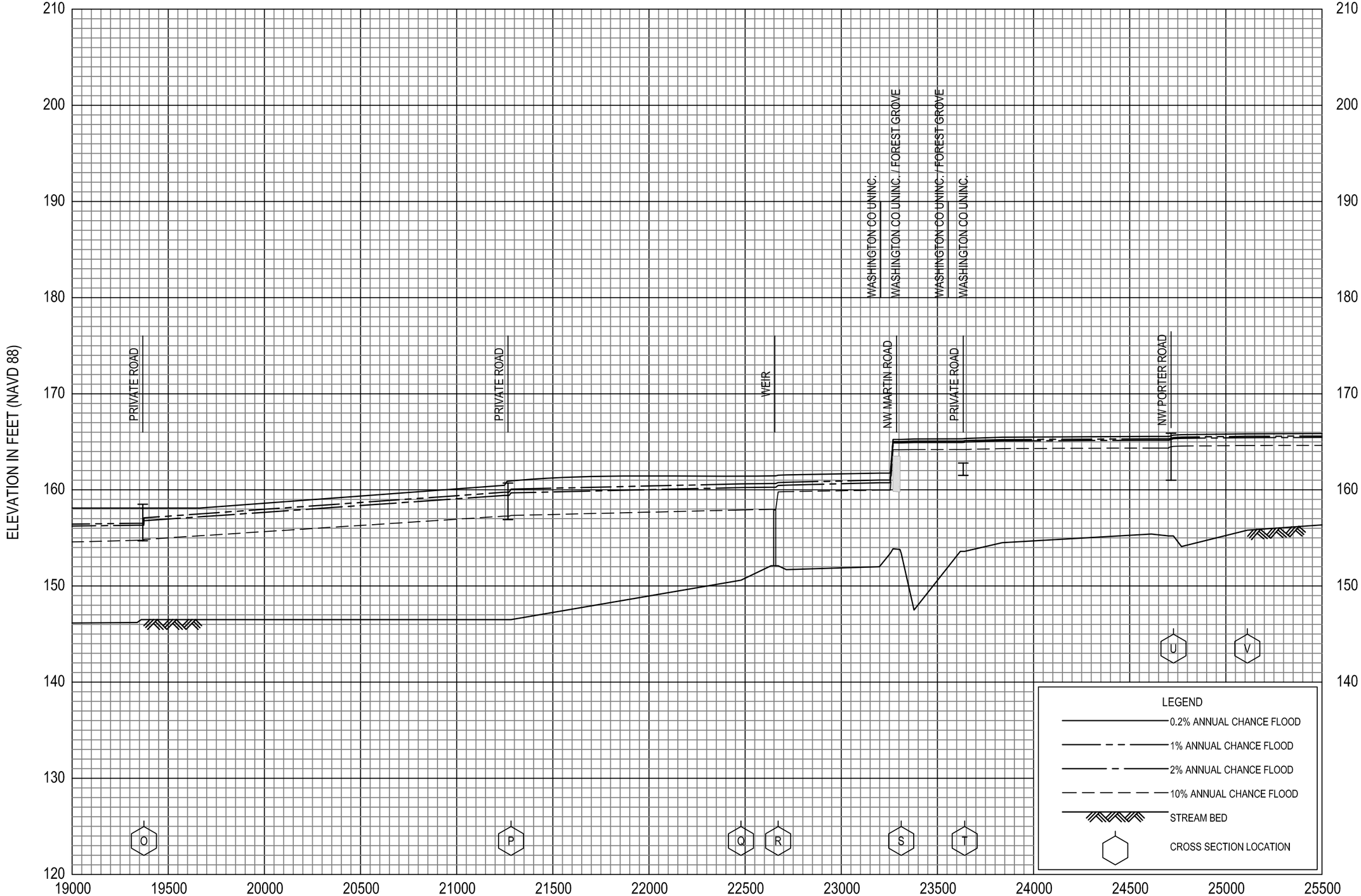


FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

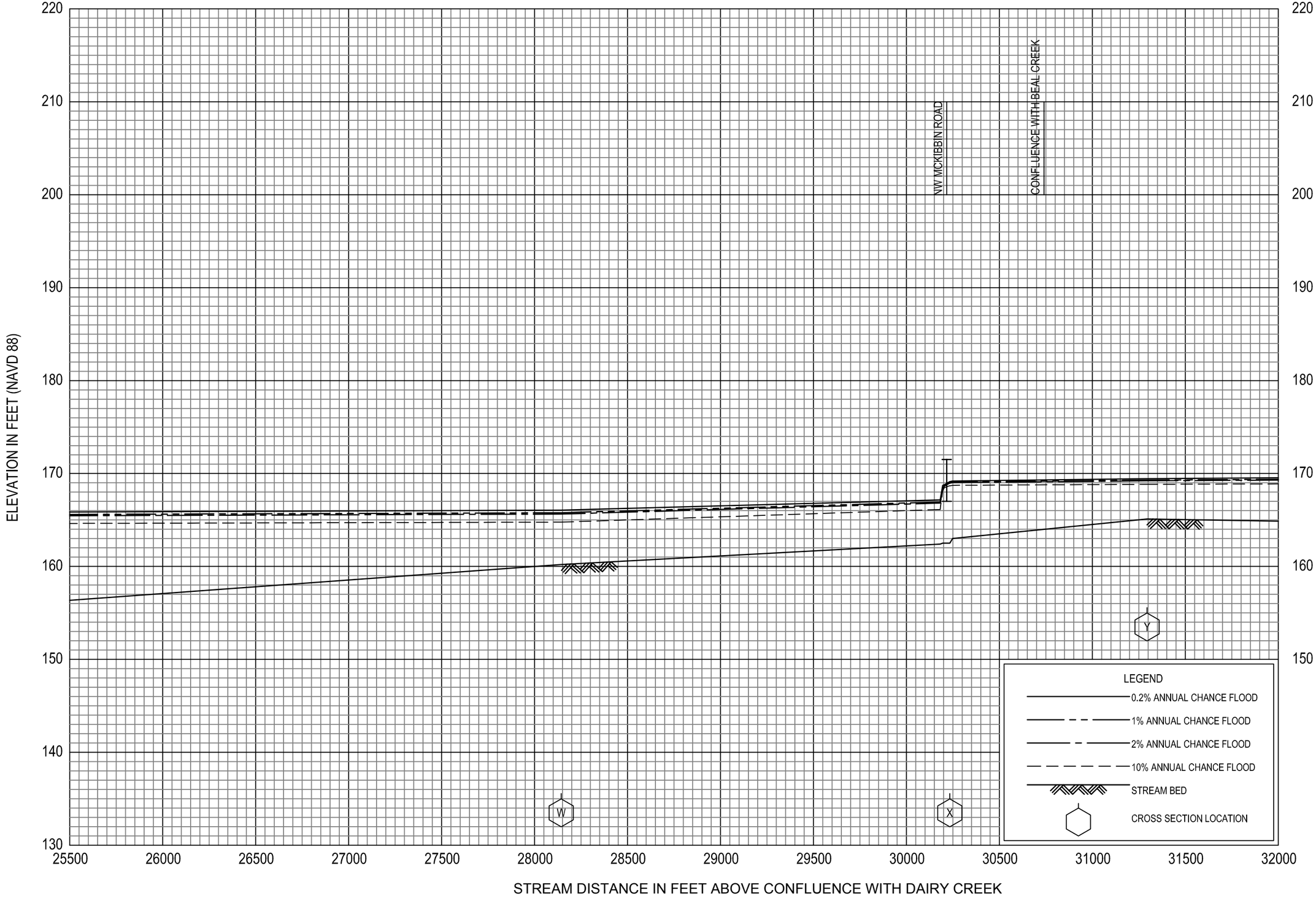


FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

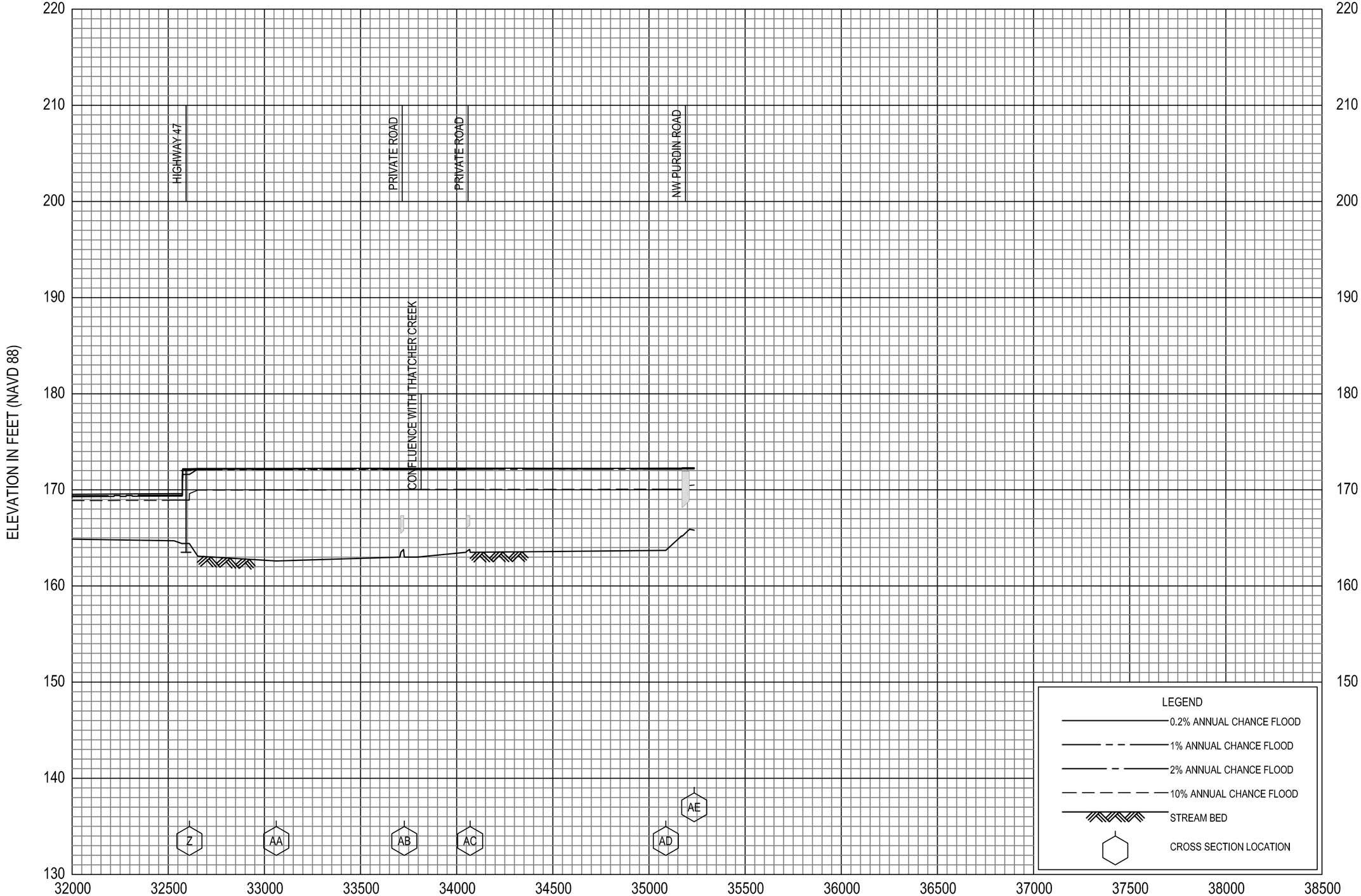


FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



FLOOD PROFILES

COUNCIL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

DAIRY CREEK

ELEVATION IN FEET (NAVD 88)

170
160
150
140
130
120
110
100
90
80

CONFLUENCE WITH TUALATIN RIVER

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH TUALATIN RIVER

A

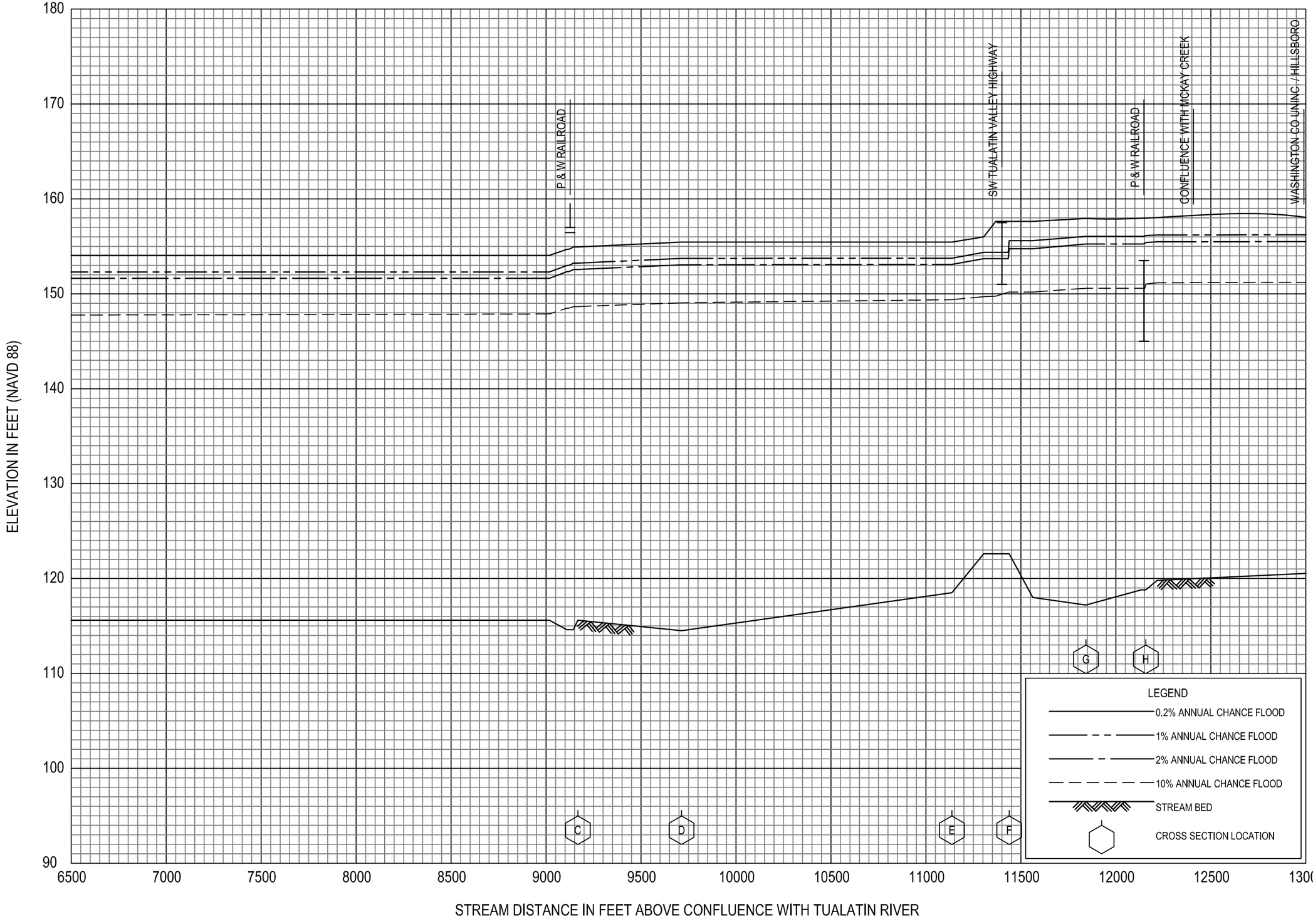
B

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

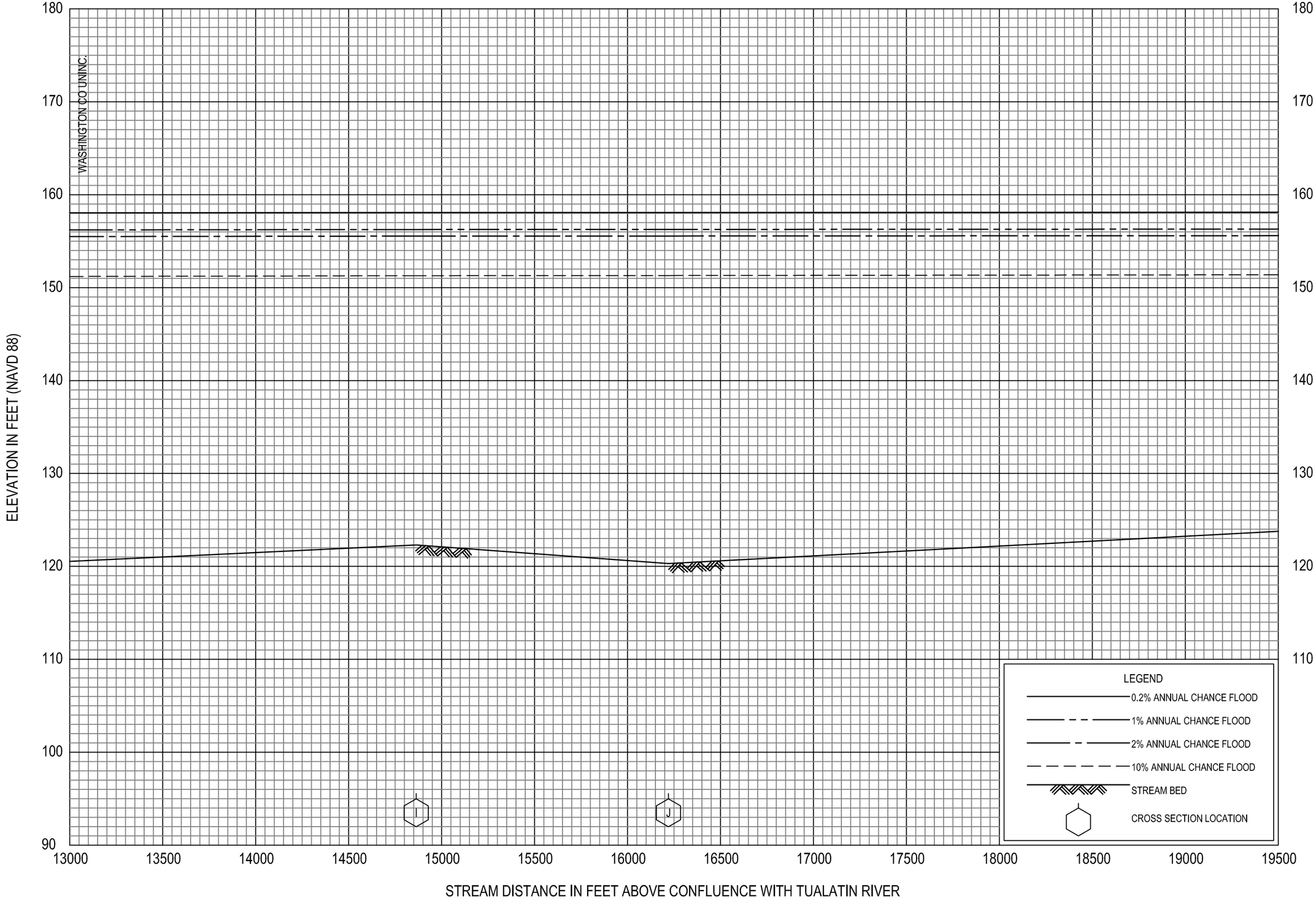


FLOOD PROFILES

DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



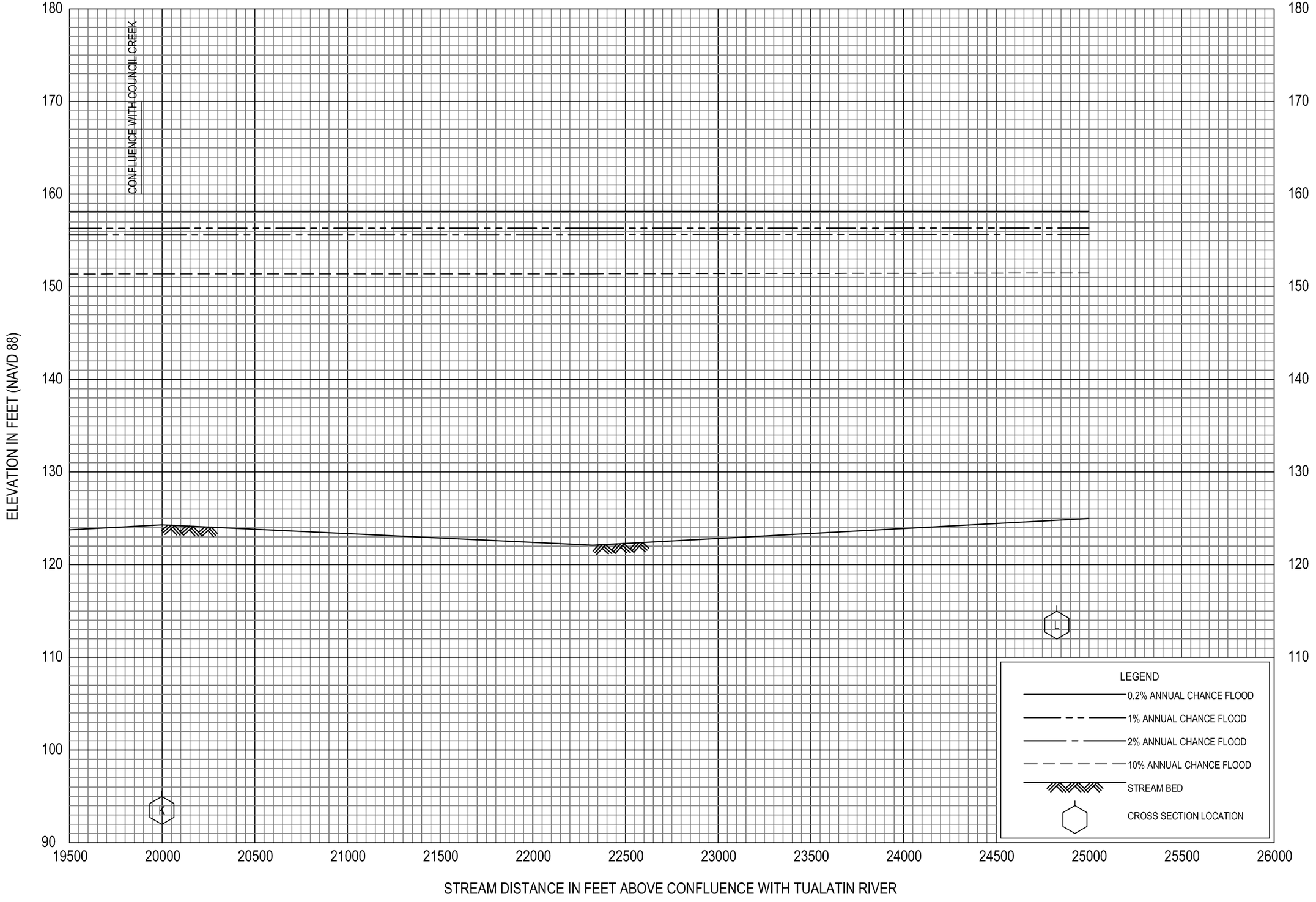
FLOOD PROFILES

DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

46P



FLOOD PROFILES

DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

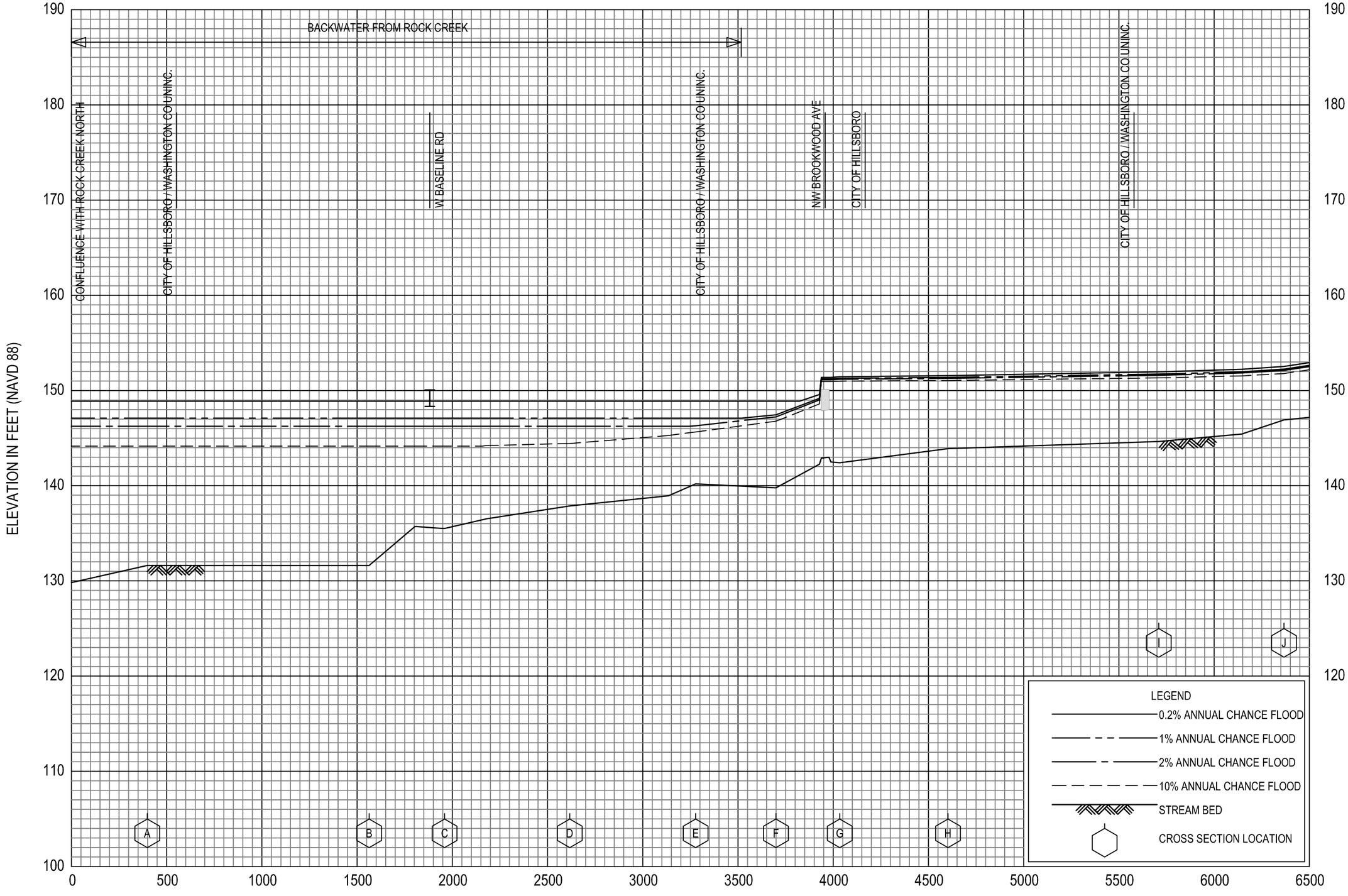
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

47P

FLOOD PROFILES

DAIRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

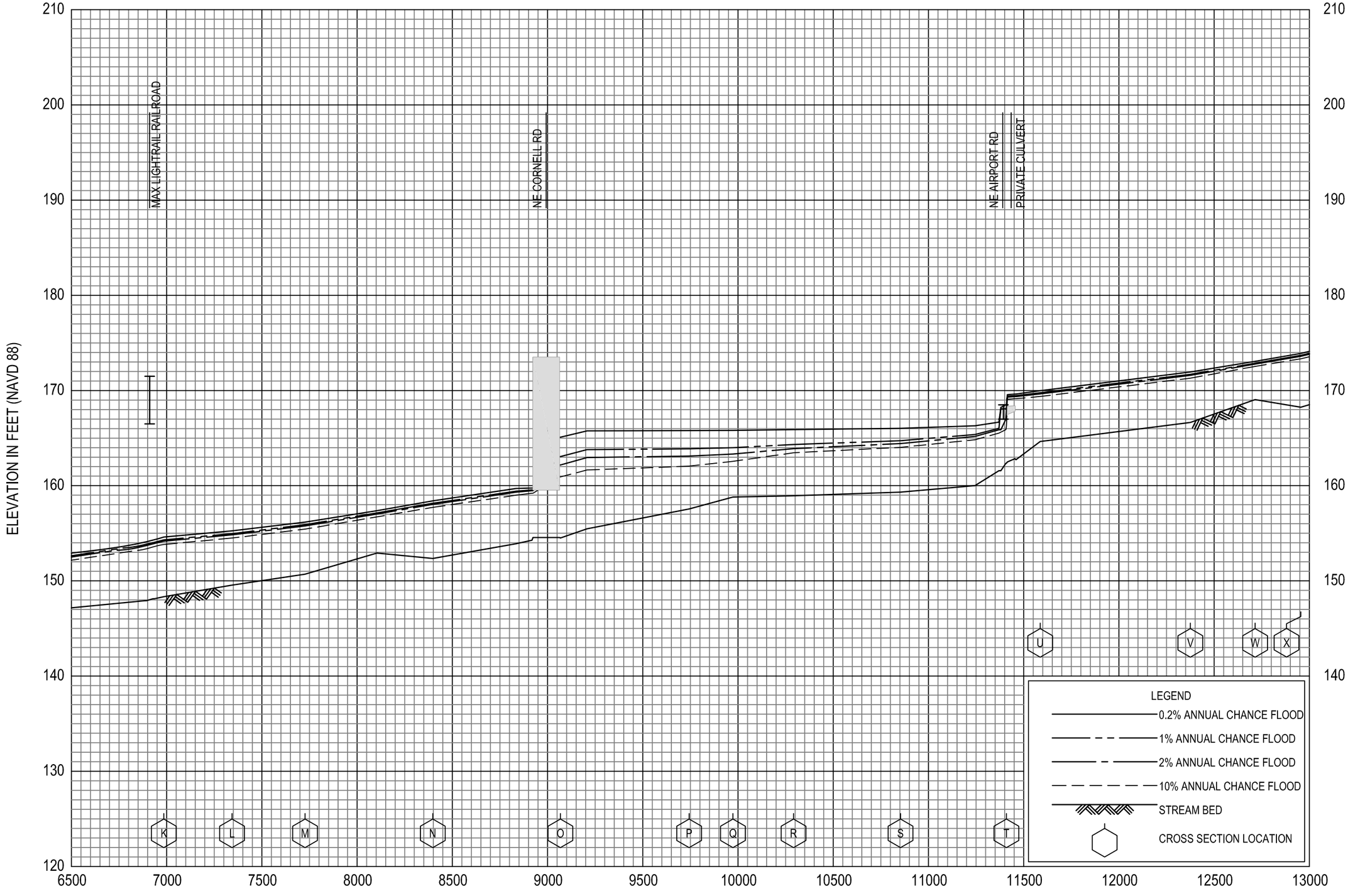


FLOOD PROFILES

DAWSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

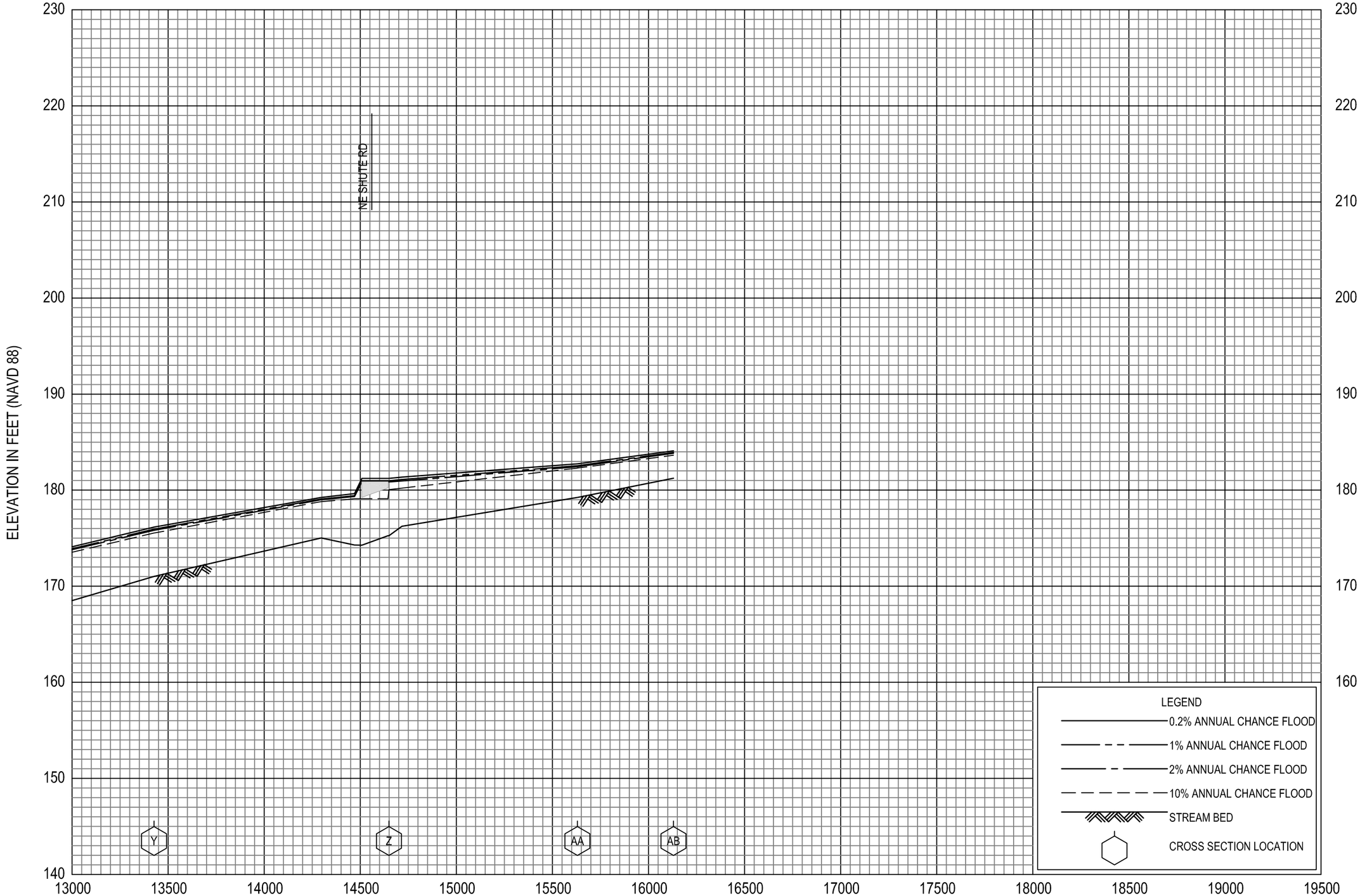


FLOOD PROFILES

DAWSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

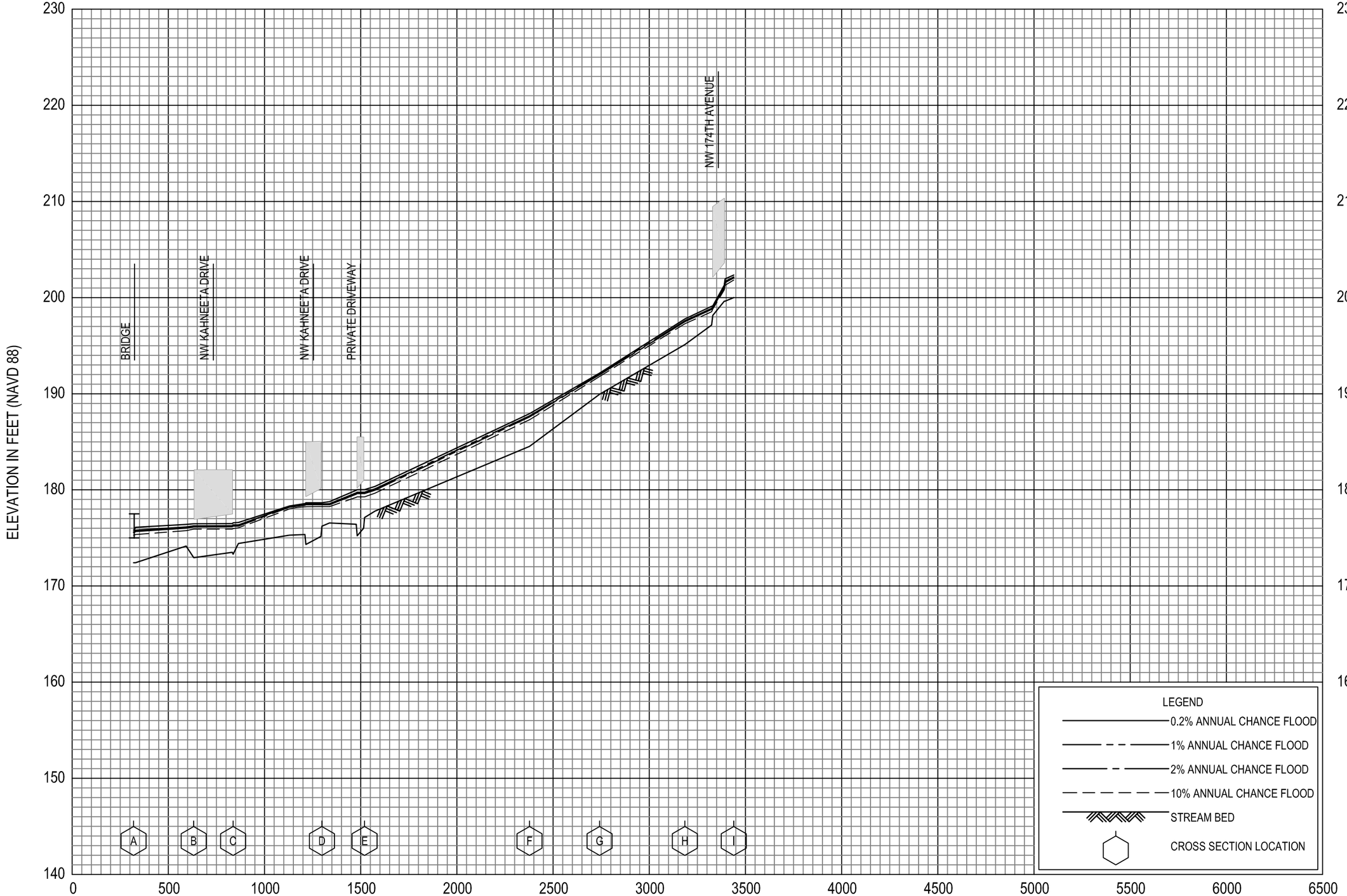


FLOOD PROFILES

DAWSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

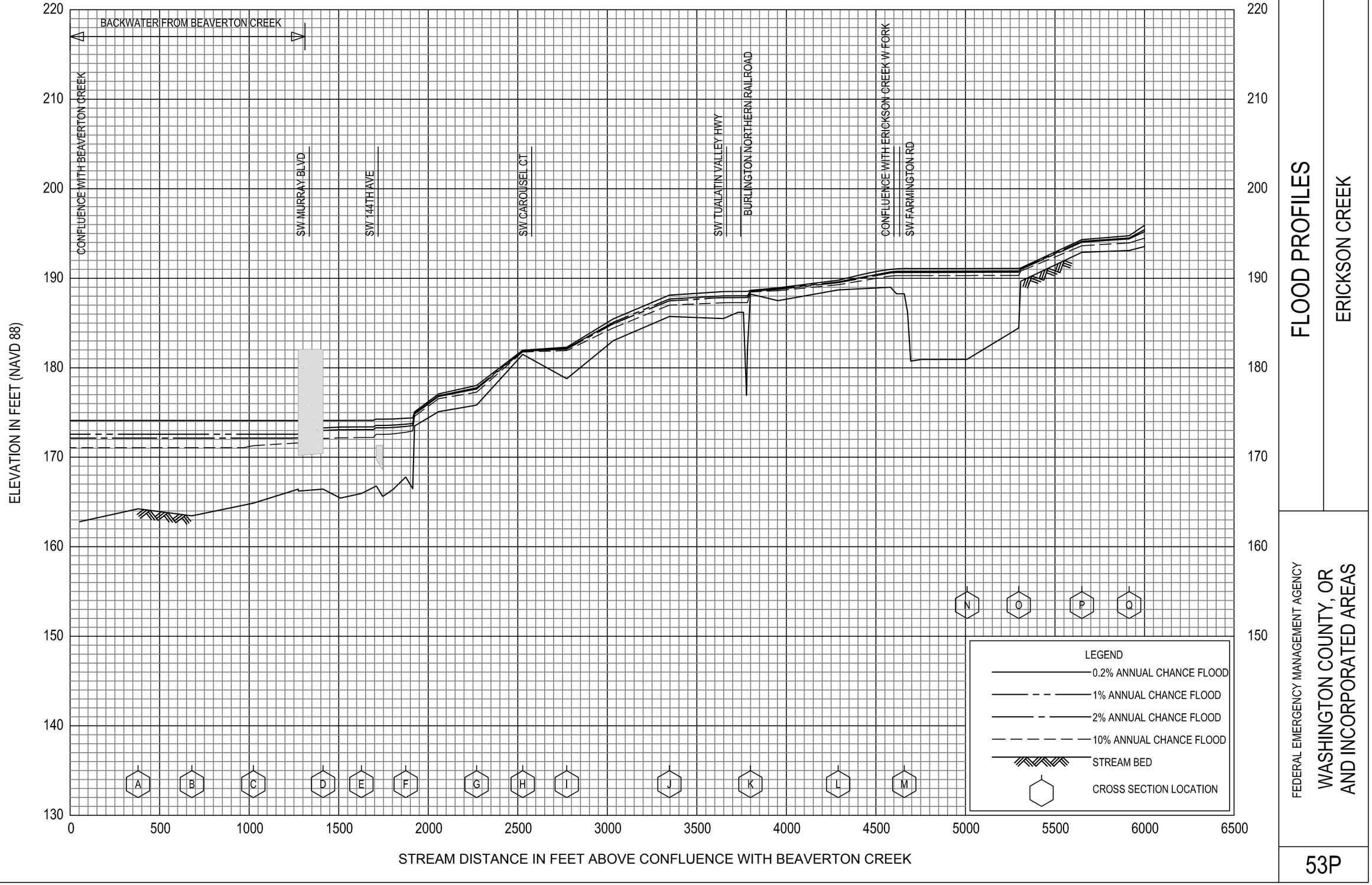


FLOOD PROFILES

DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

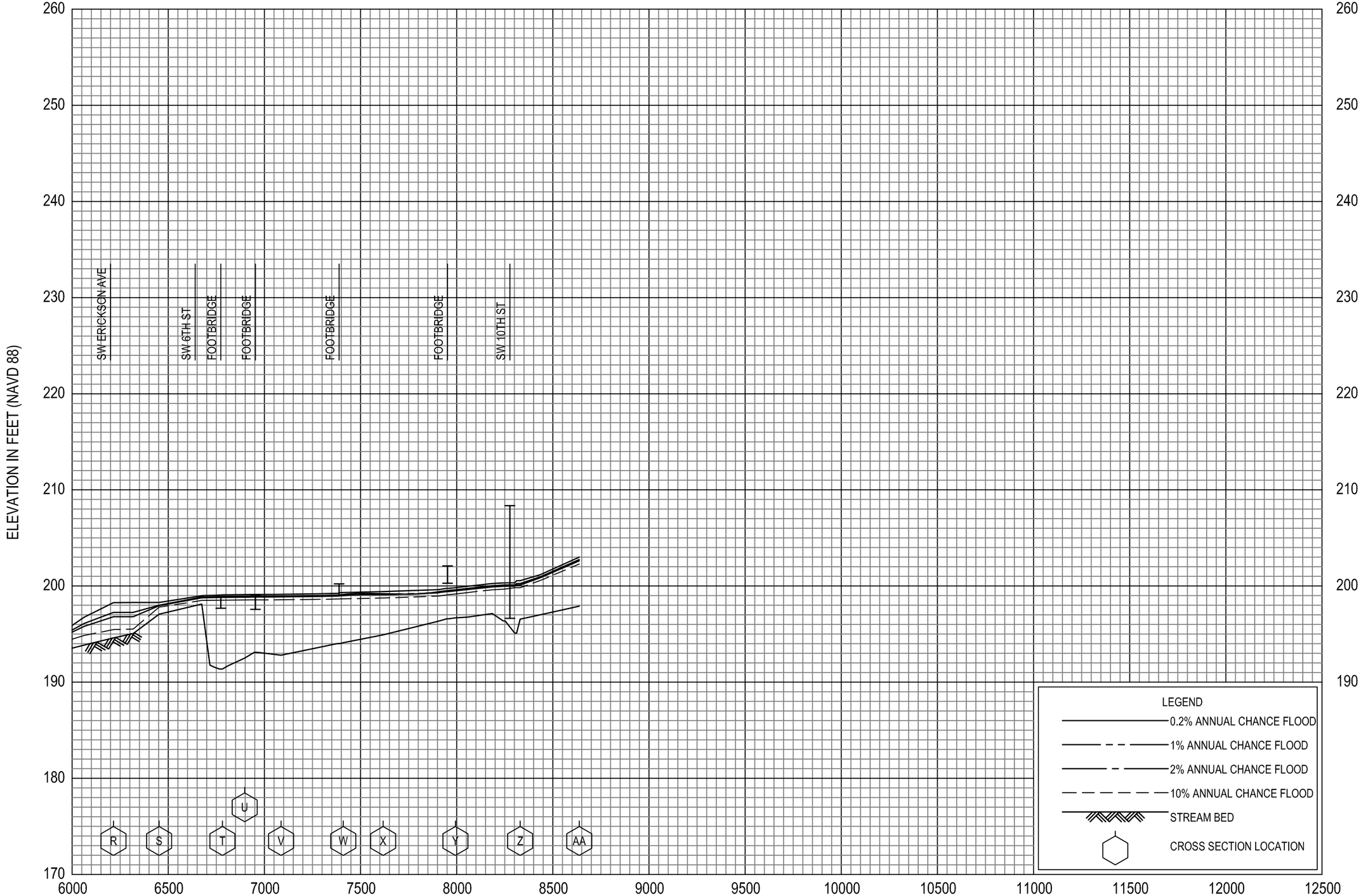


FLOOD PROFILES

ERICKSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

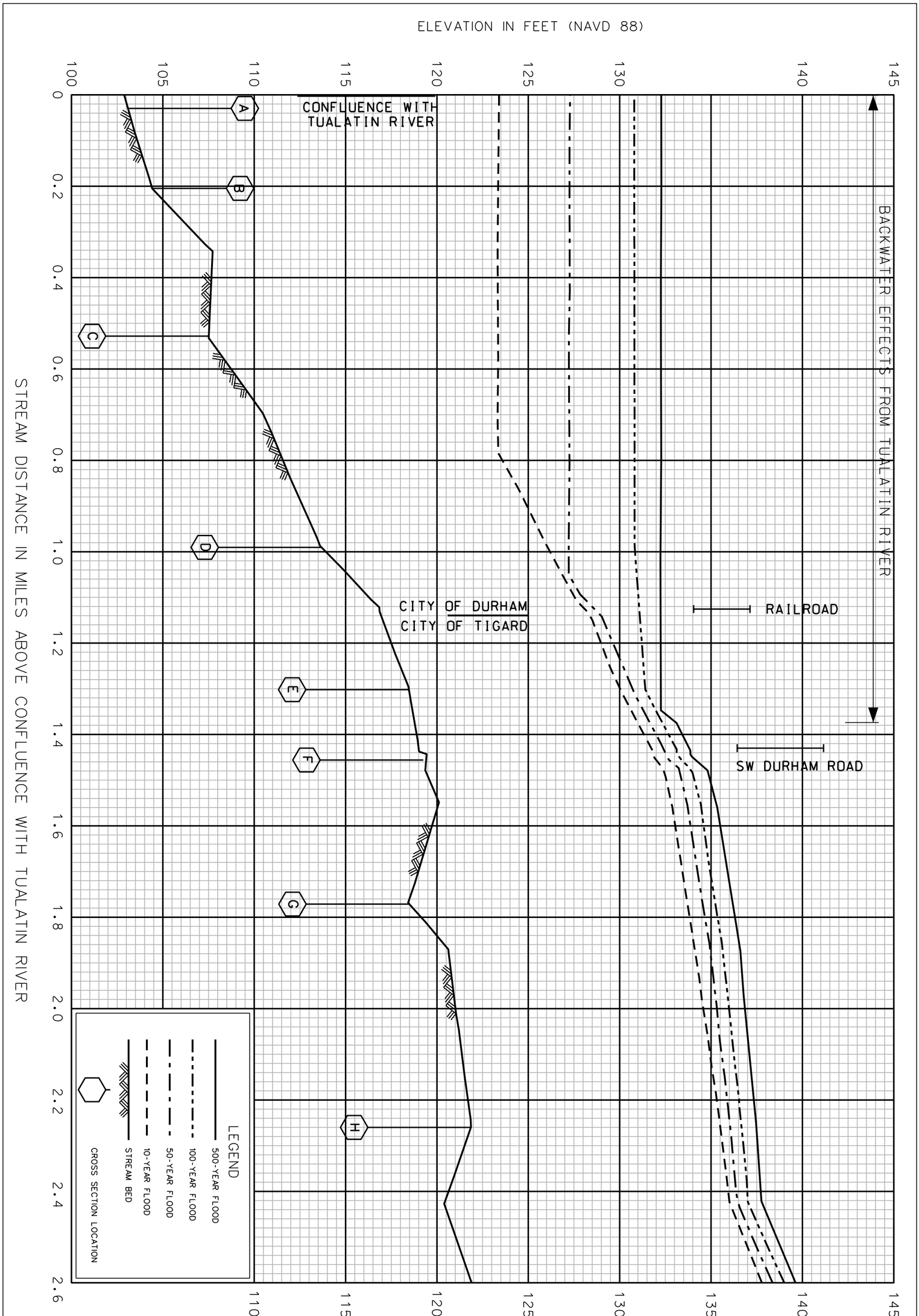


FLOOD PROFILES

ERICKSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



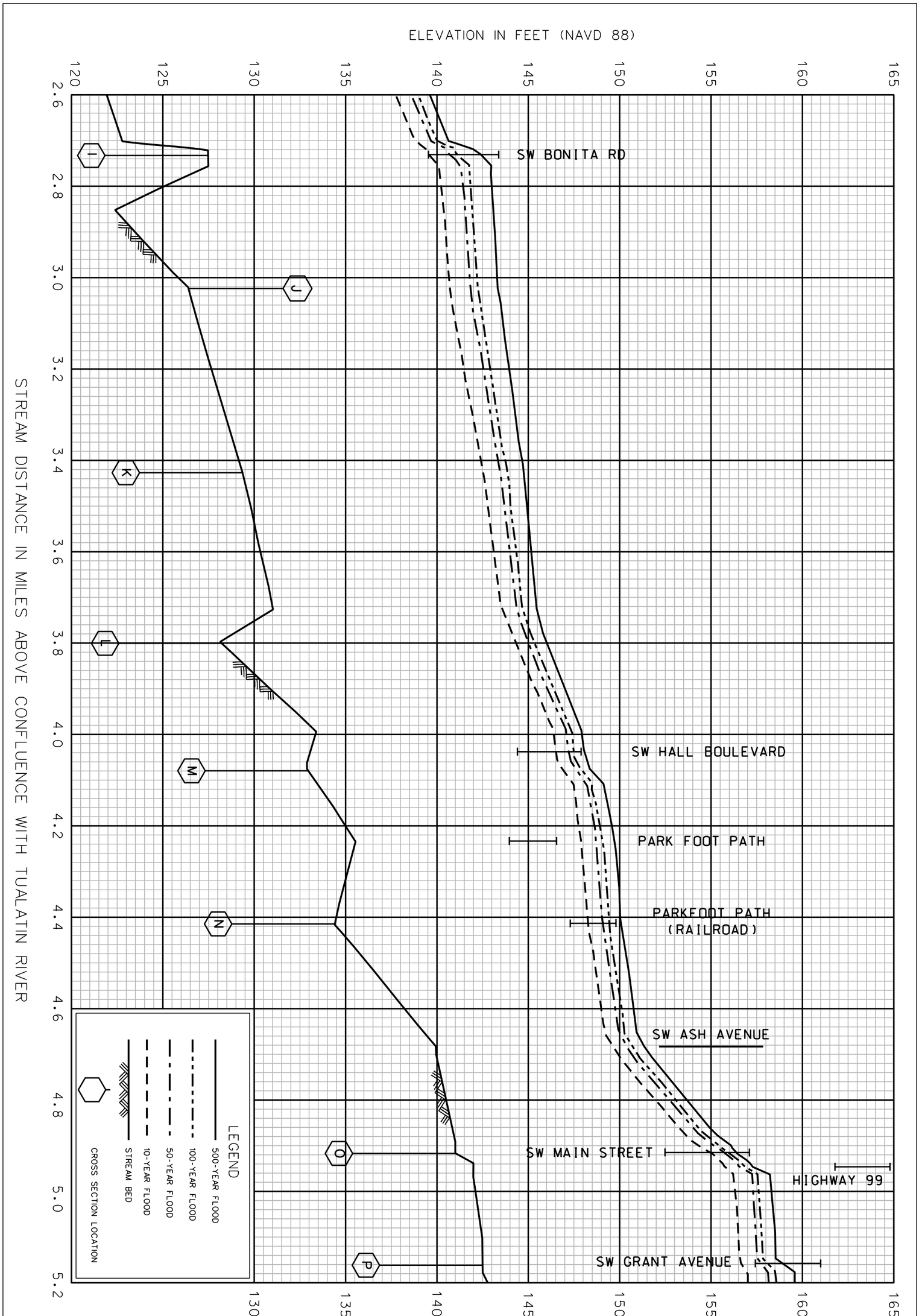
55P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK



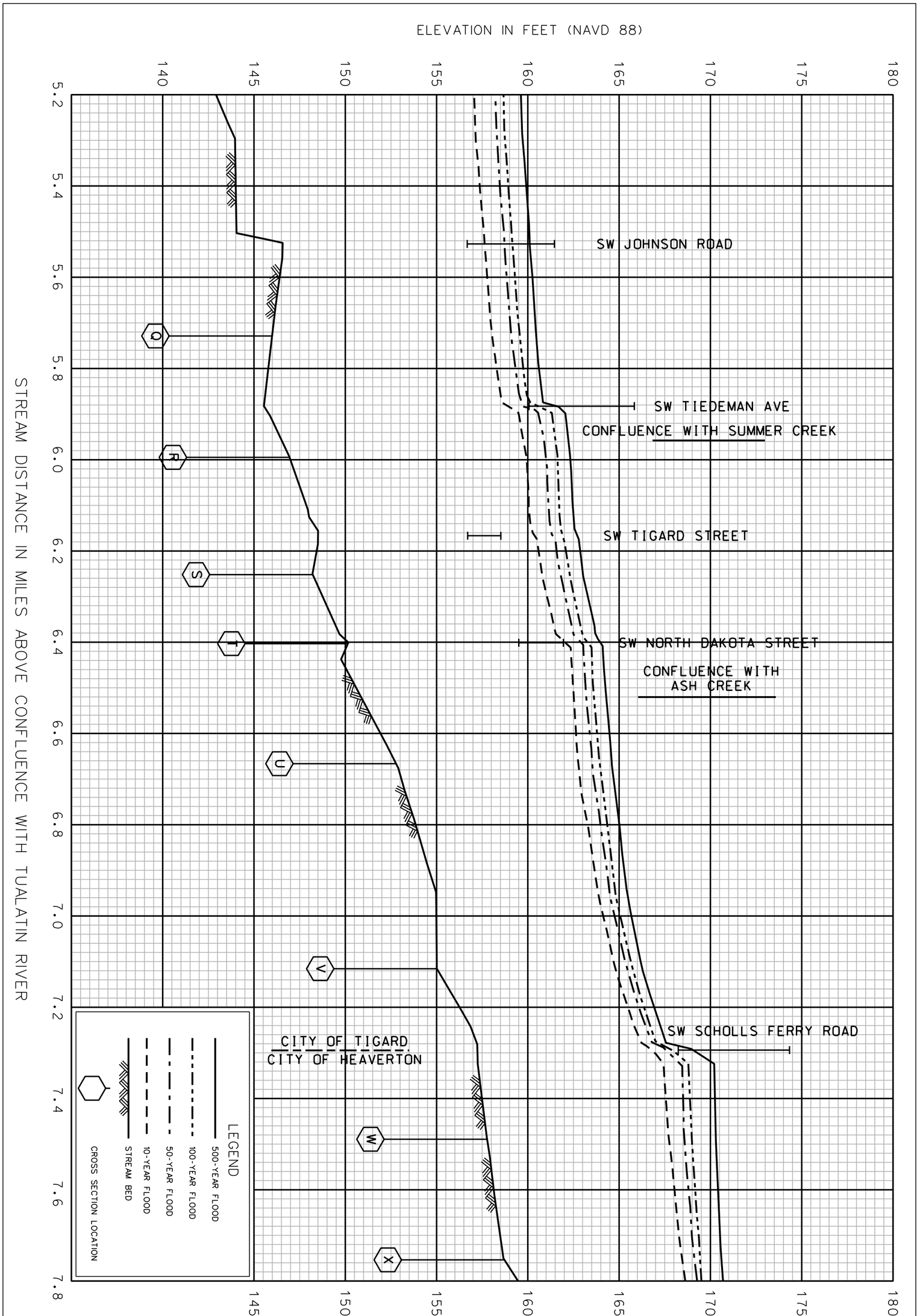
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FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK



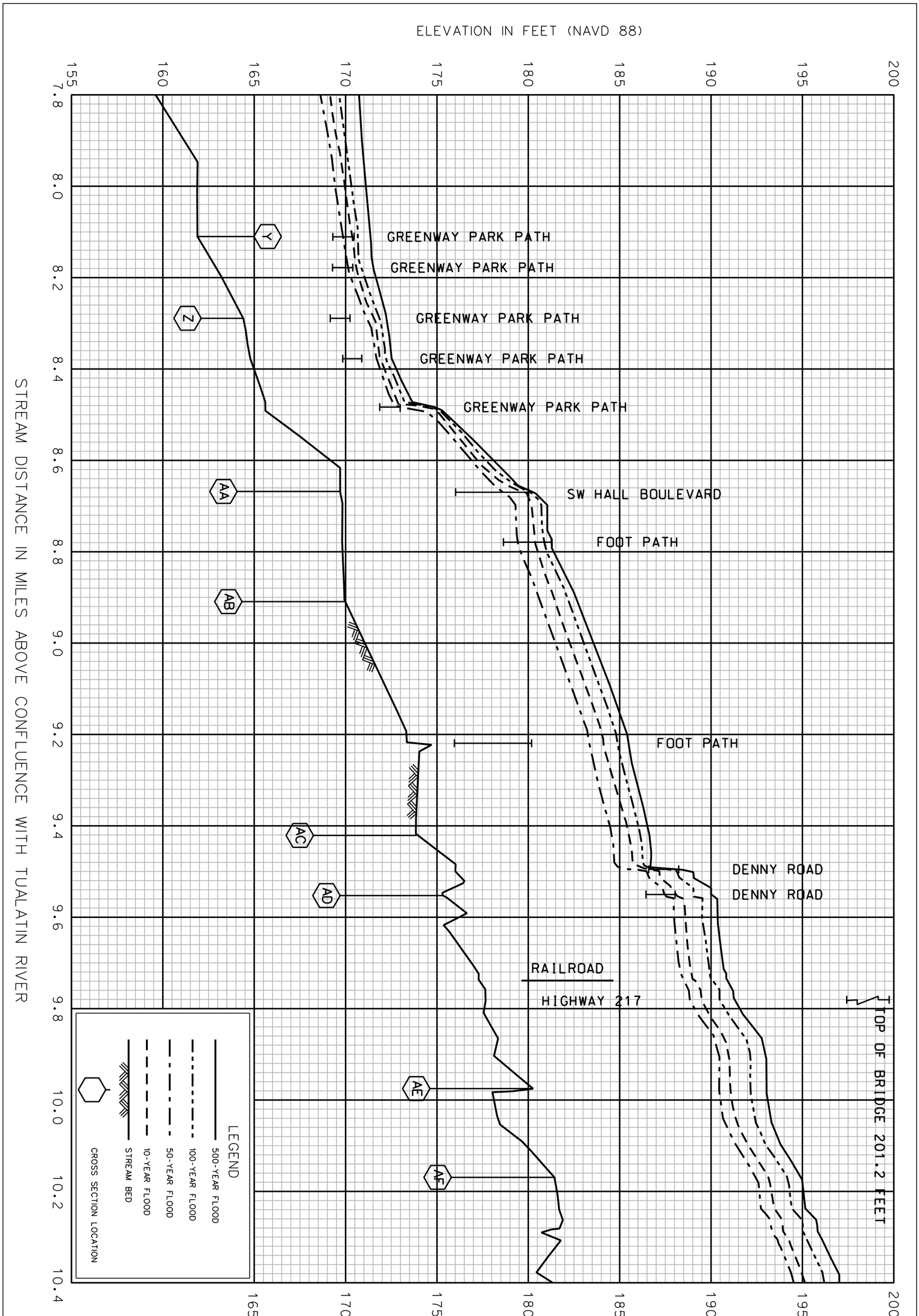
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FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK



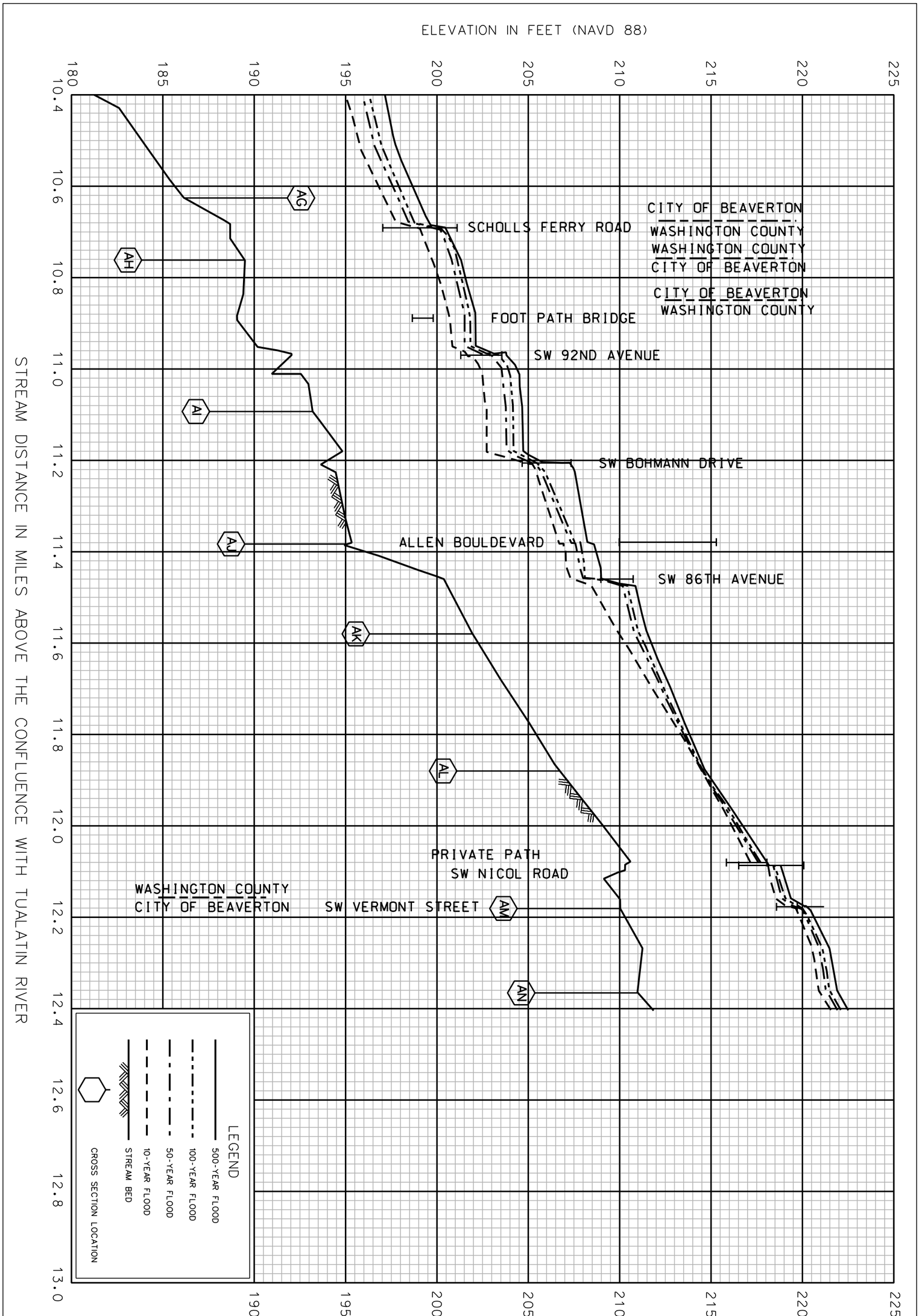
58P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK

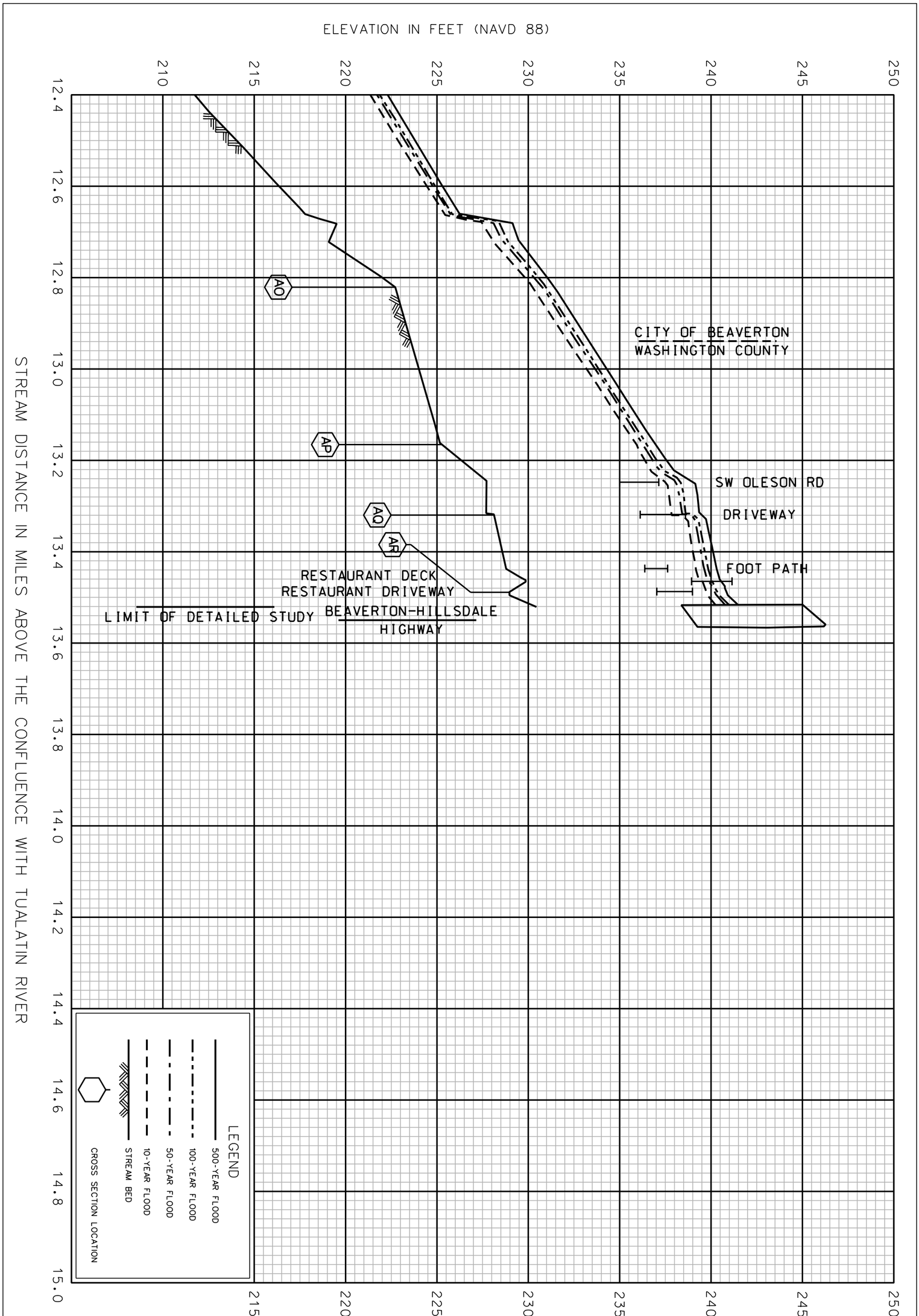


59P

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK



60P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

FANNO CREEK

BACKWATER FROM TUALATIN RIVER

CONFLUENCE WITH TUALATIN RIVER

RAILROAD

TUALATIN VALLEY HIGHWAY

RAILROAD

STATE HIGHWAY 47

ELEVATION IN FEET (NAVD 88)

210
200
190
180
170
160
150
140
130

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH TUALATIN RIVER

A B C D E F G

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

61P

ELEVATION IN FEET (NAVD 88)

220
210
200
190
180
170
160
150
140

SW RITCHEY ROAD

H
I
J
K
L
M
N

LEGEND
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION

2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH TUALATIN RIVER

FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

GALES CREEK

ELEVATION IN FEET (NAVD 88)

240
230
220
210
200
190
180
170
160
150

5.2 5.4 5.6 5.8 6.0 6.2 6.4 6.6 6.8 7.0 7.2 7.4 7.6 7.8

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH TUALATIN RIVER

N O P Q R S T

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

63P

ELEVATION IN FEET (NAVD 88)

250
240
230
220
210
200
190
180
170

NW STRINGTOWN ROAD

SW RODERICK RD

LIMIT OF DETAILED STUDY

U
V
W
X
Y
Z
AA
AB

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

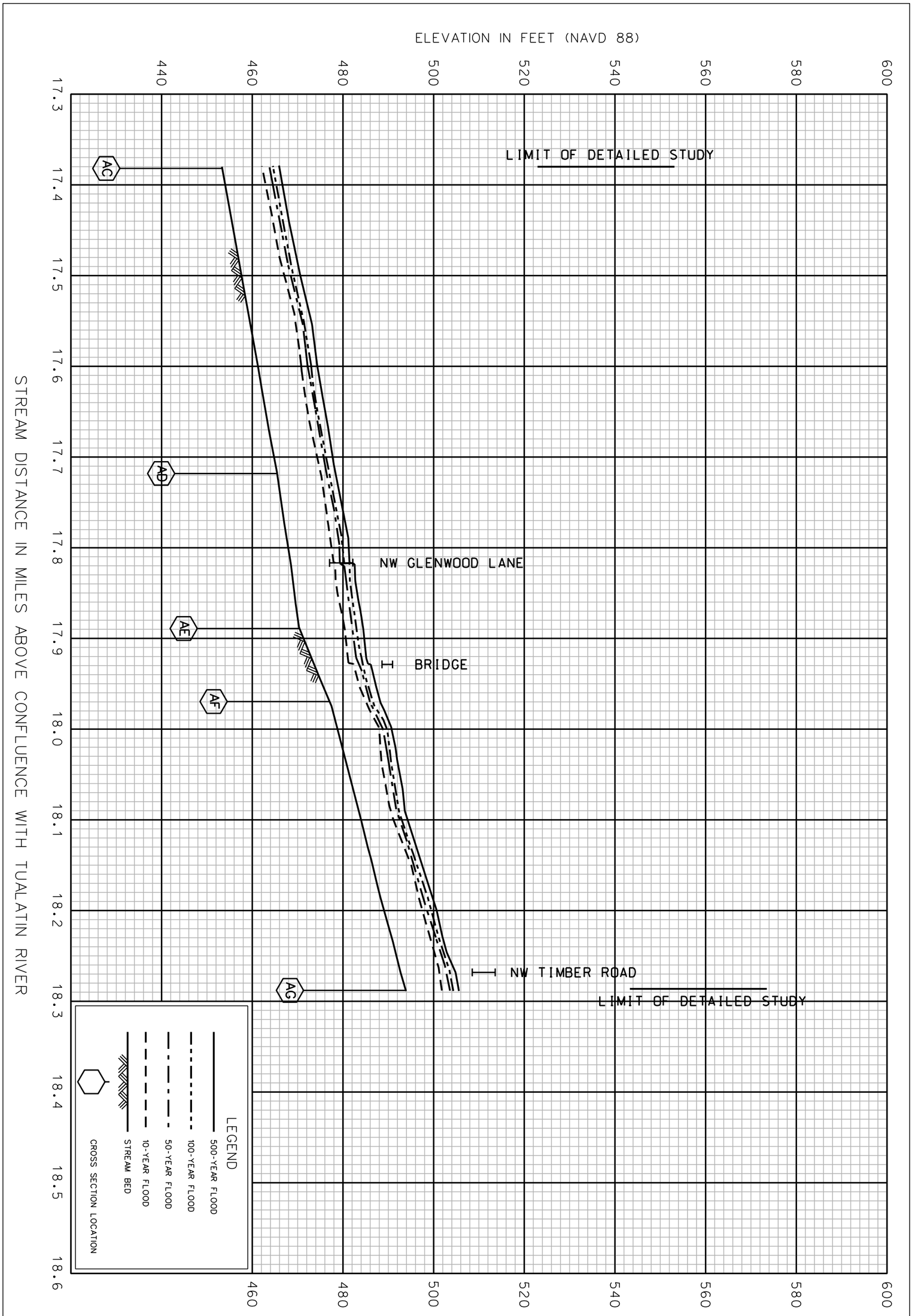
7.8 8.0 8.2 8.4 8.6 8.8 9.0 9.2 9.4 9.6 9.8 10.0 10.2 10.4

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH TUALATIN RIVER

FLOOD PROFILES

GALES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



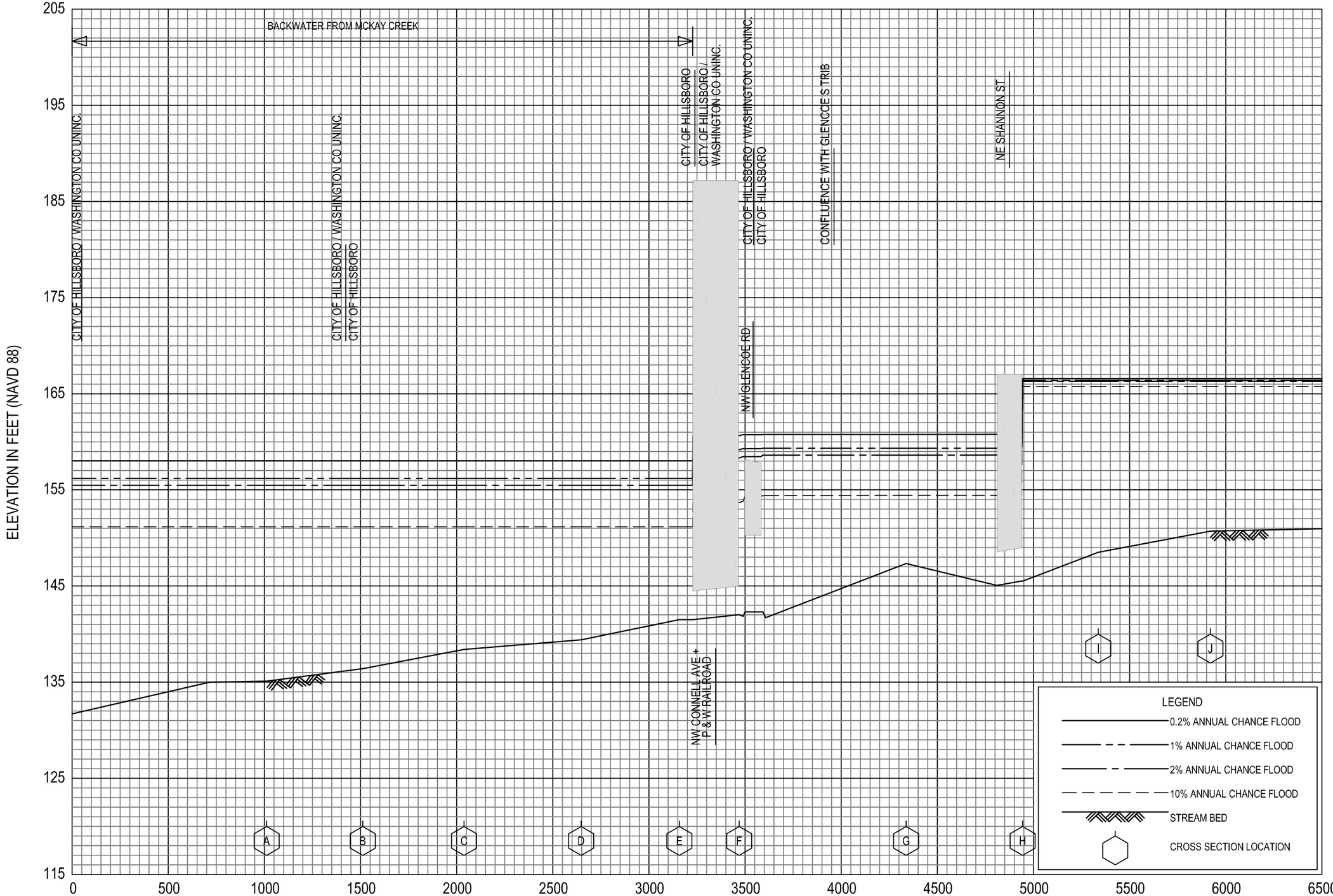
65P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

GALES CREEK



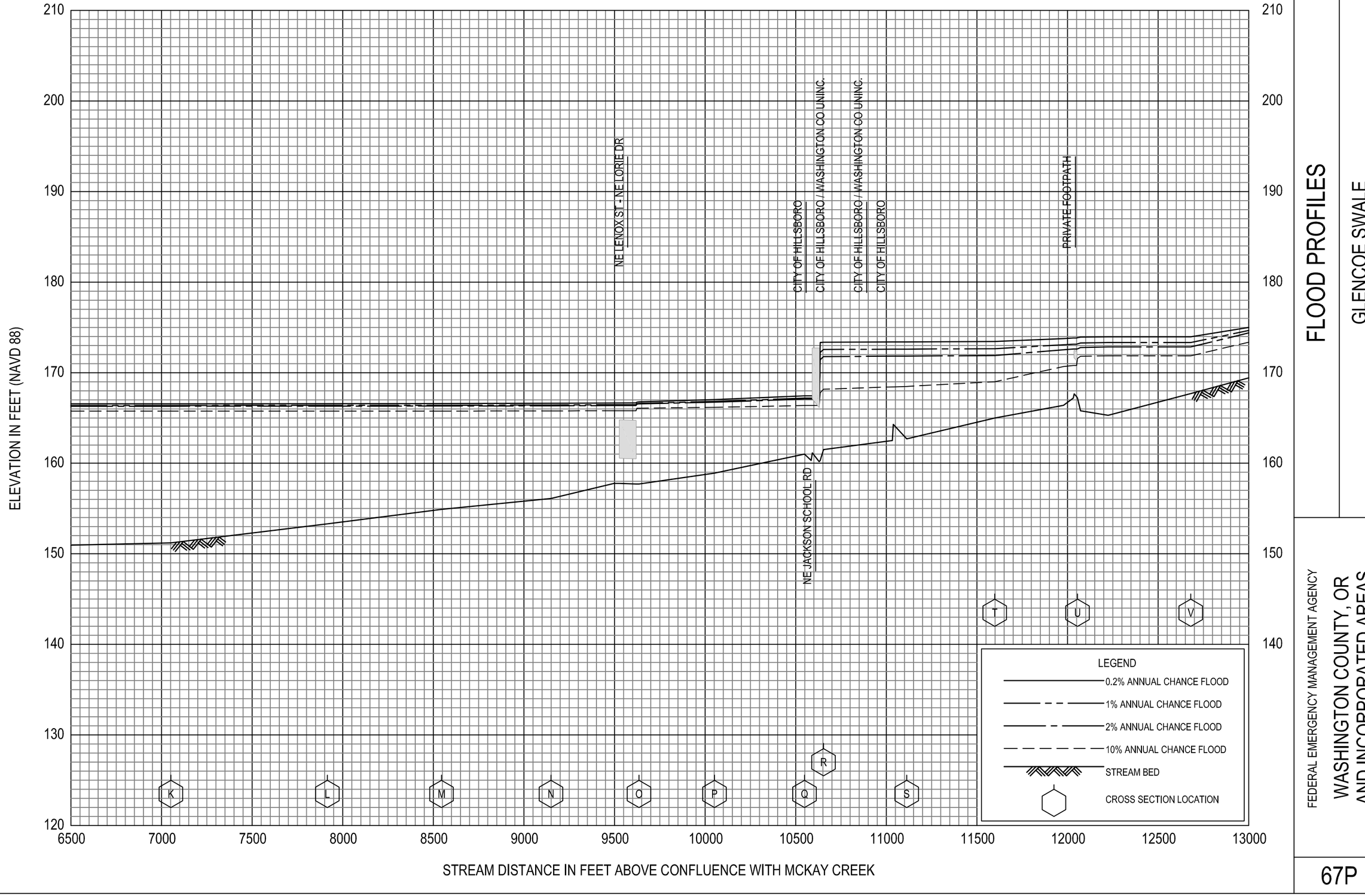
FLOOD PROFILES

GLENCOE SWALE

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

66P



FLOOD PROFILES

GLENCOE SWALE

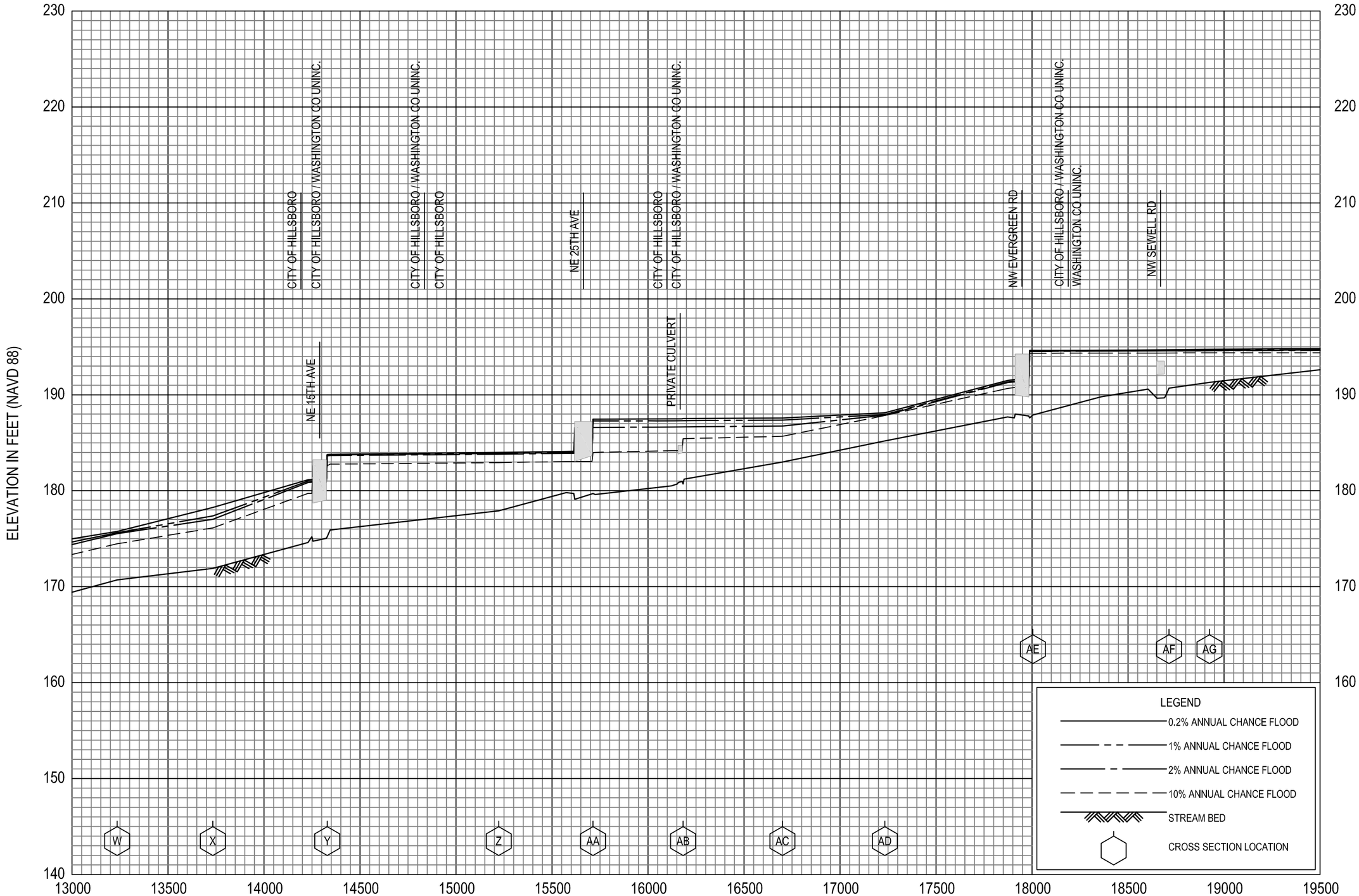
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

67P

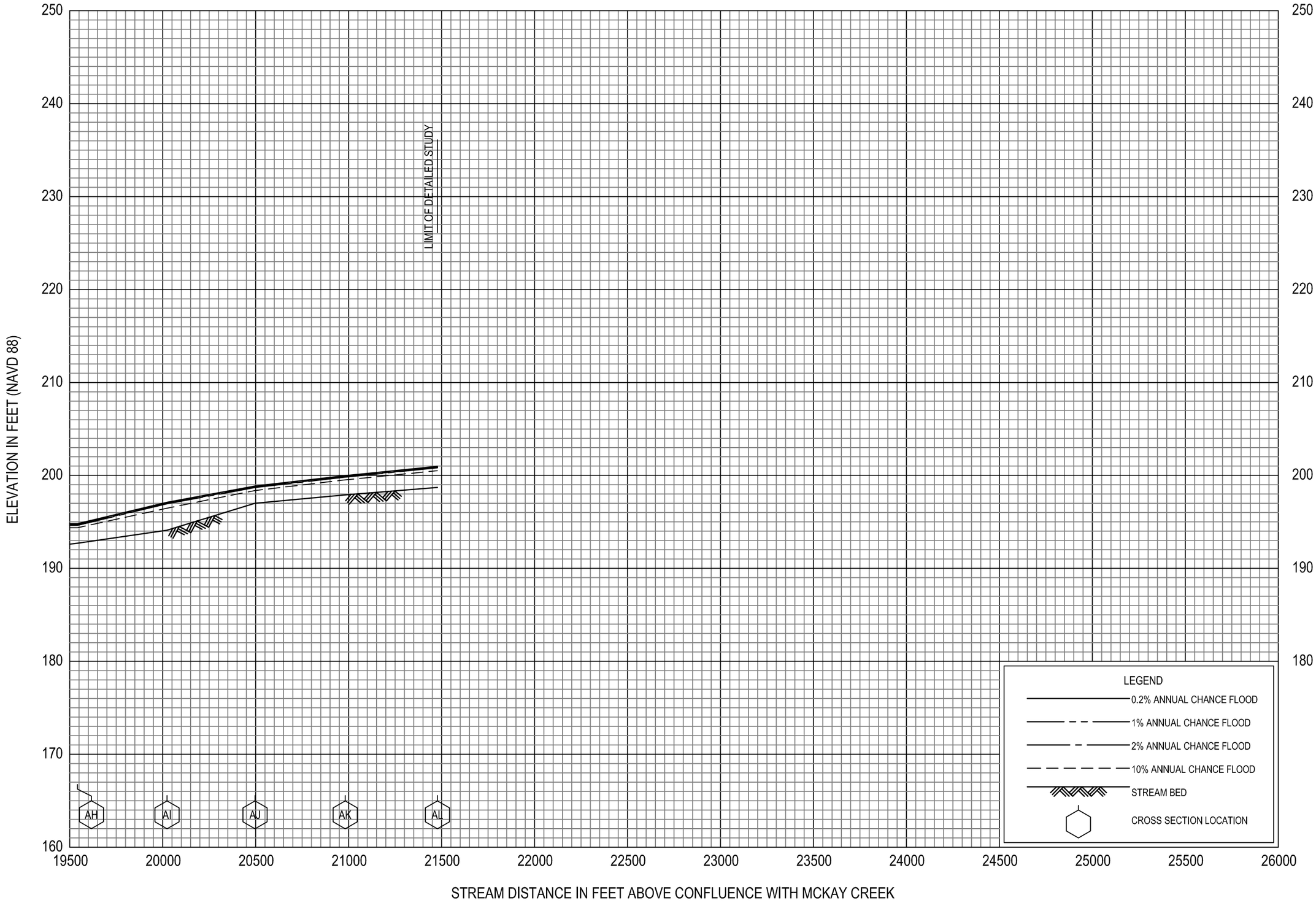
FLOOD PROFILES

GLENCOE SWALE



FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



FLOOD PROFILES

GLENCOE SWALE

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

69P

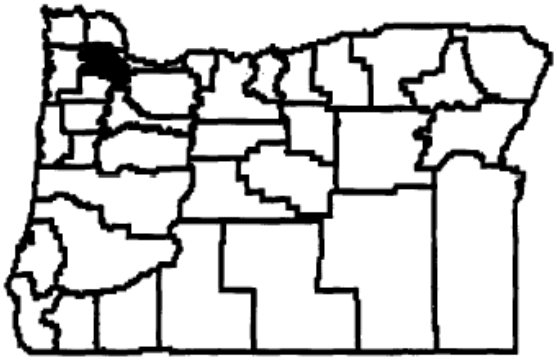
FLOOD INSURANCE STUDY



WASHINGTON COUNTY, OREGON
AND INCORPORATED AREAS

VOLUME 3 OF 3

COMMUNITY NAME	COMMUNITY NUMBER
BANKS, CITY OF	410239
BEAVERTON, CITY OF	410240
CORNELIUS, CITY OF	410261
DURHAM, CITY OF	410263
FOREST GROVE, CITY OF	410241
GASTON, CITY OF	410242
HILLSBORO, CITY OF	410243
KING CITY, CITY OF	410269
NORTH PLAINS, CITY OF	410270
SHERWOOD, CITY OF	410273
TIGARD, CITY OF	410276
TUALATIN, CITY OF	410277
WASHINGTON COUNTY UNINCORPORATED AREAS	410238



Effective: November 4, 2016

Federal Emergency Management Agency

Flood Insurance Study Number
41067CV003A

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map panels for the community contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by a Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS report components.

Users should refer to Section 10.0, Revisions Descriptions. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this FIS report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: November 4, 2016

Revised FIS Report Dates:

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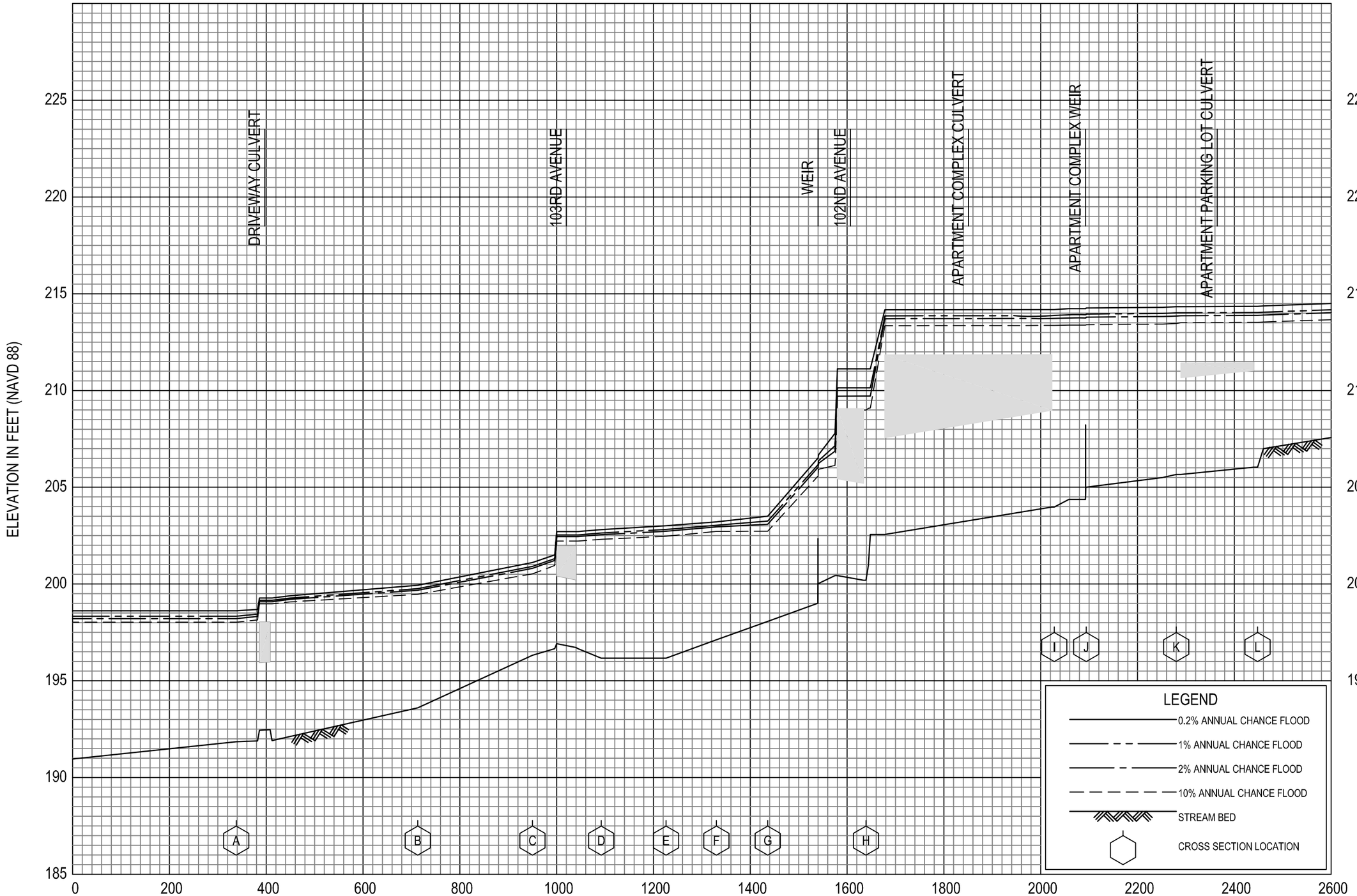
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PUBLISHED SEPARATELY

Flood Insurance Rate Map Index

Flood Insurance Rate Map



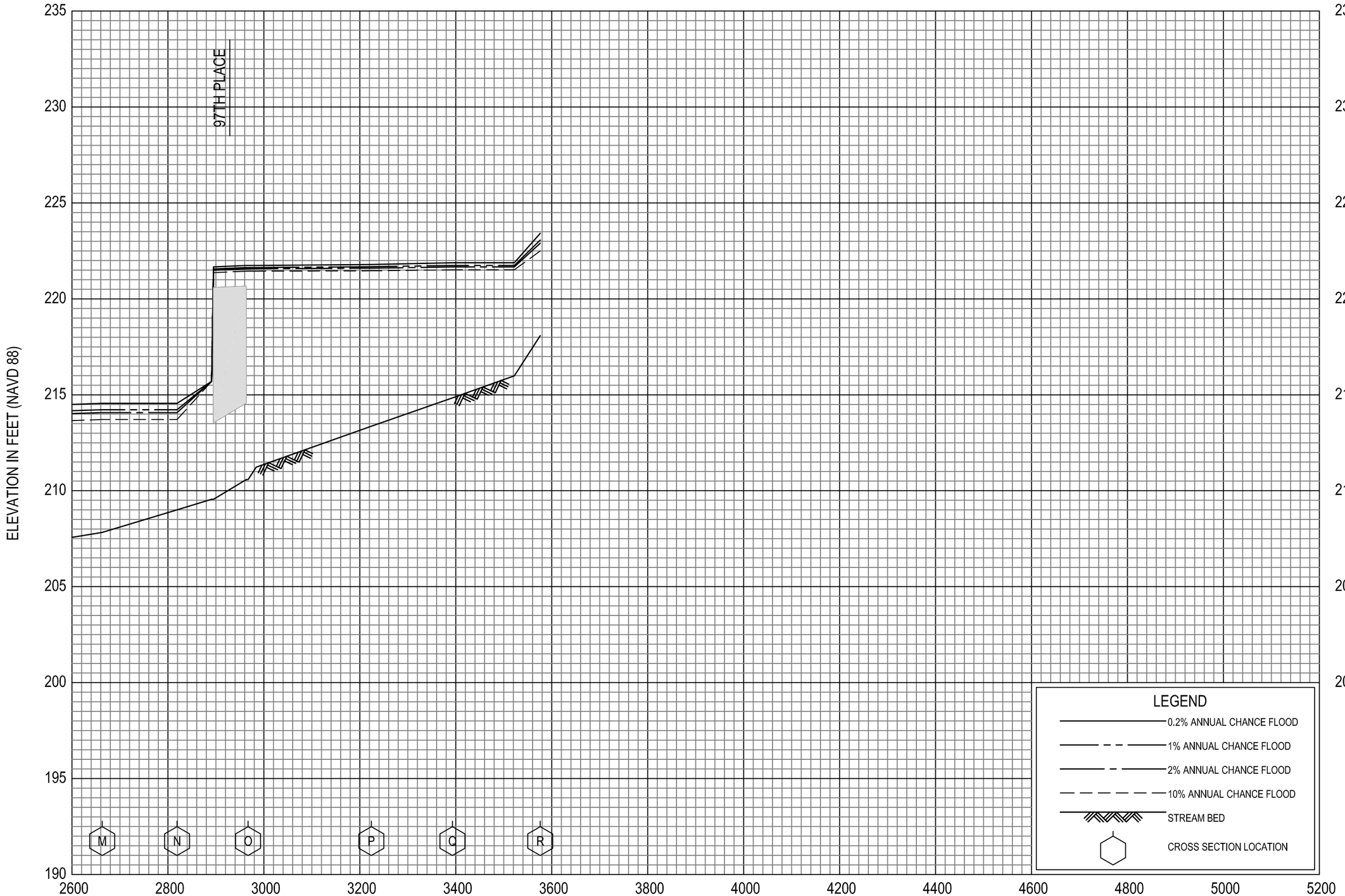
FLOOD PROFILES

GOLF CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

70P



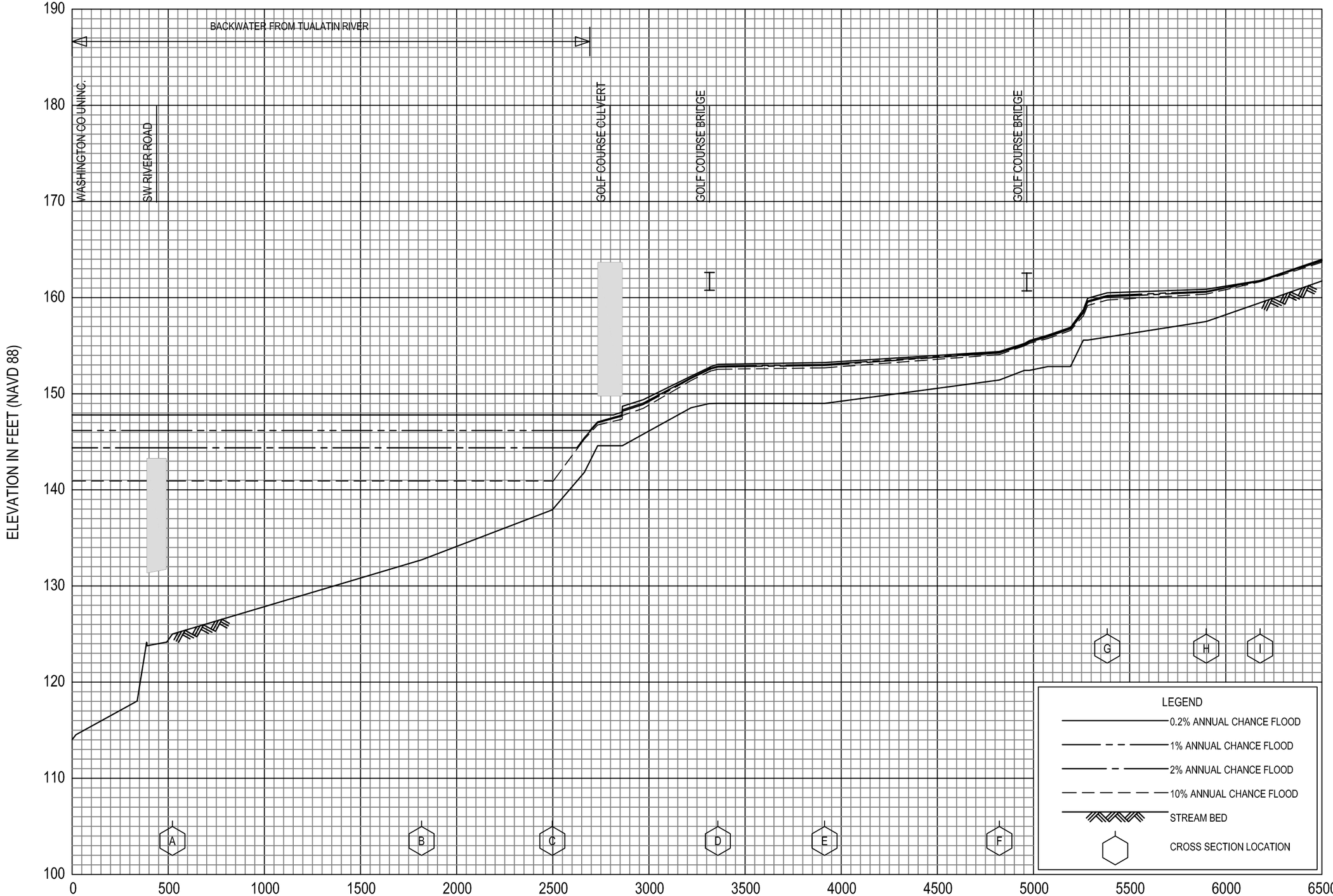
FLOOD PROFILES

GOLF CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

71P



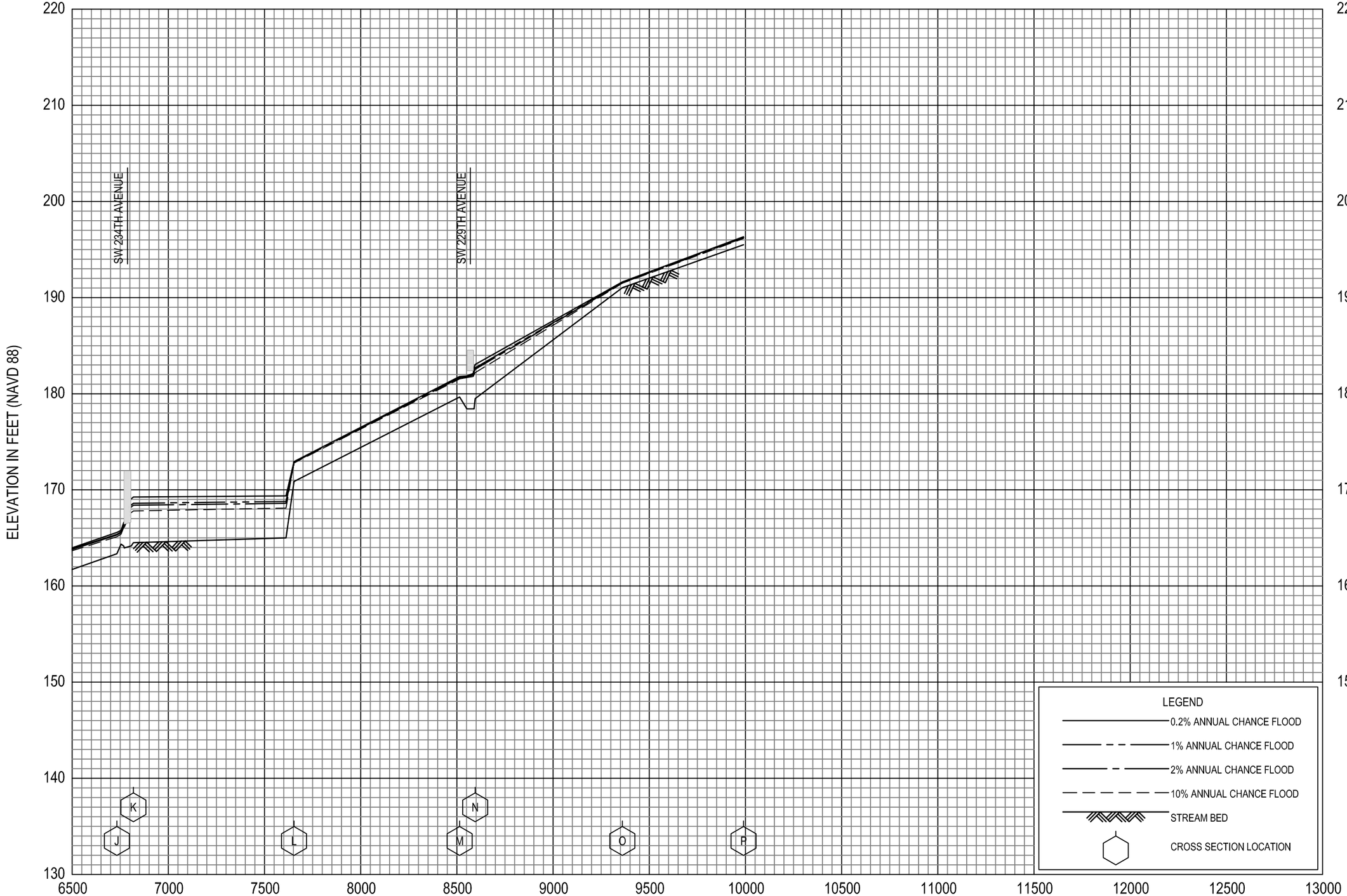
FLOOD PROFILES

GORDON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

72P

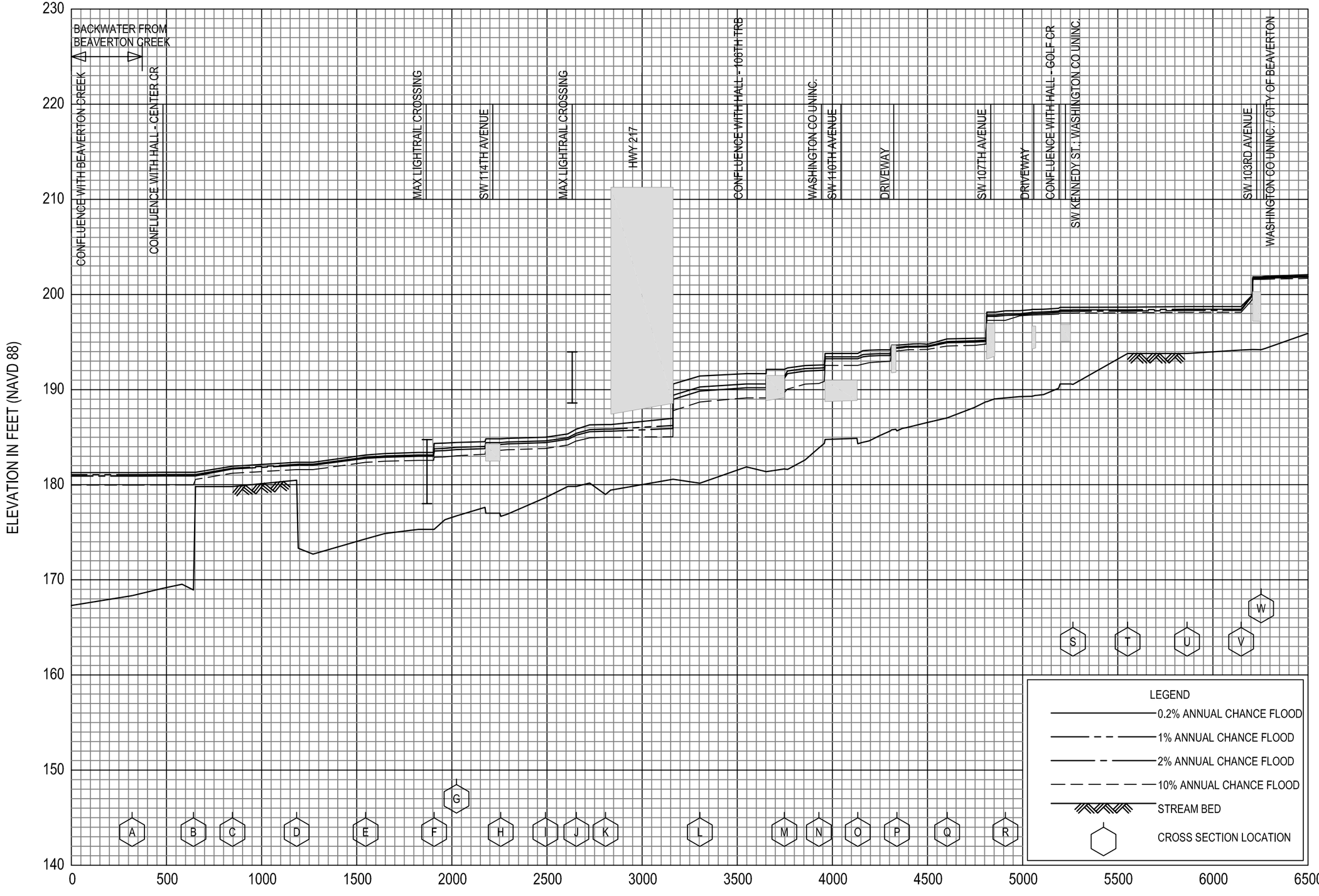


FLOOD PROFILES

GORDON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



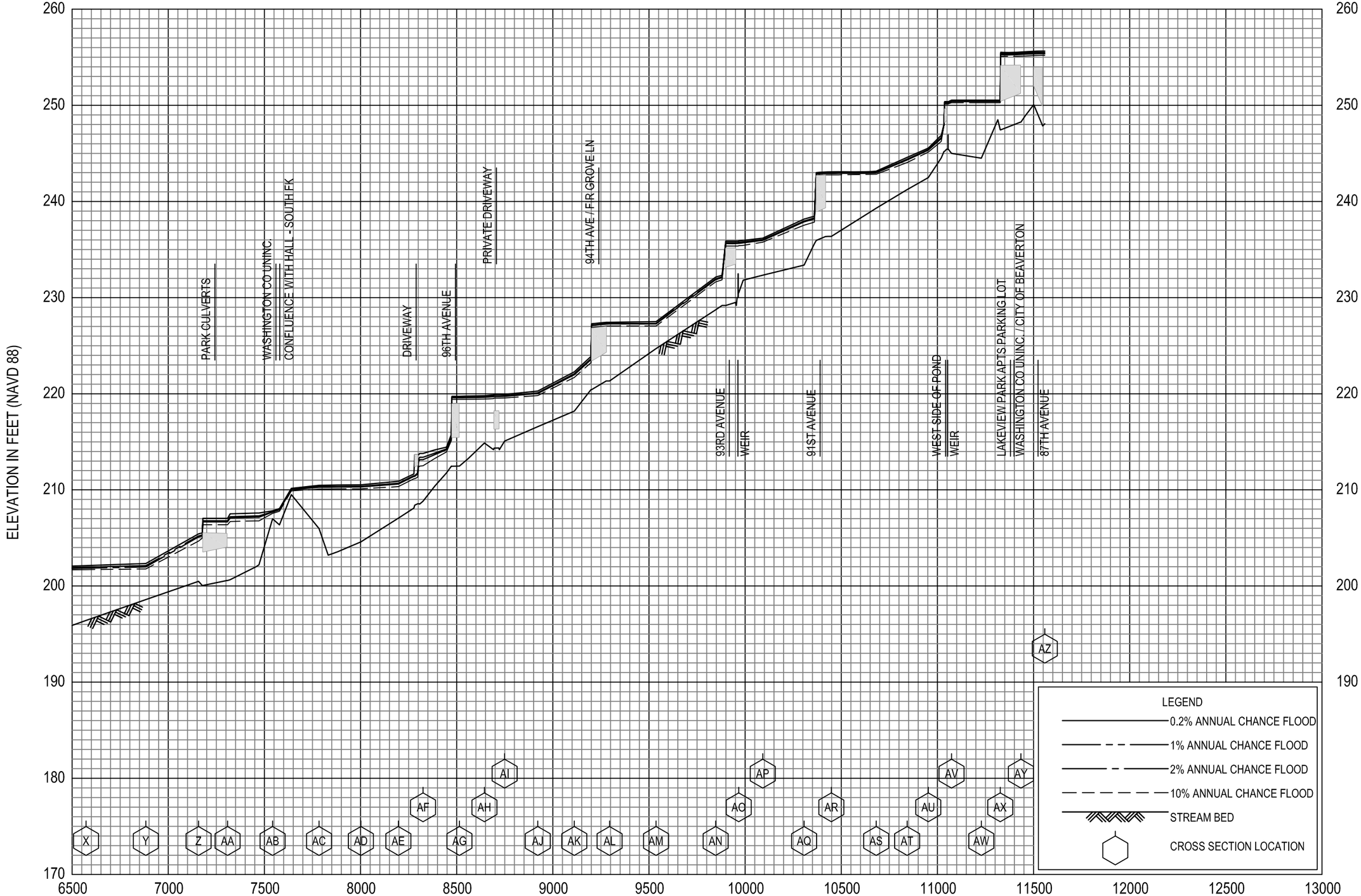
FLOOD PROFILES

HALL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(AND INCORPORATED AREAS)

74P

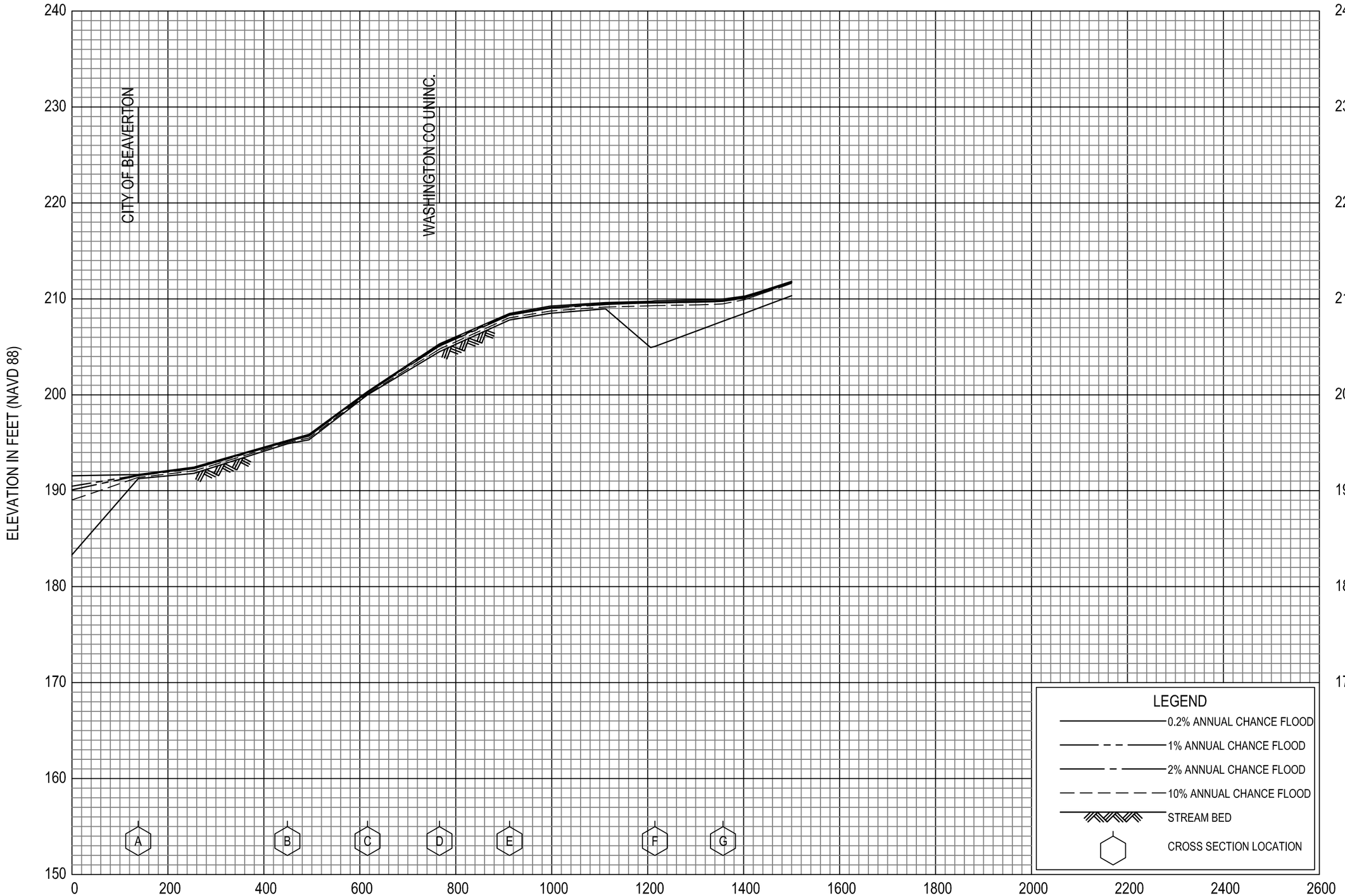


FLOOD PROFILES

HALL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(AND INCORPORATED AREAS)

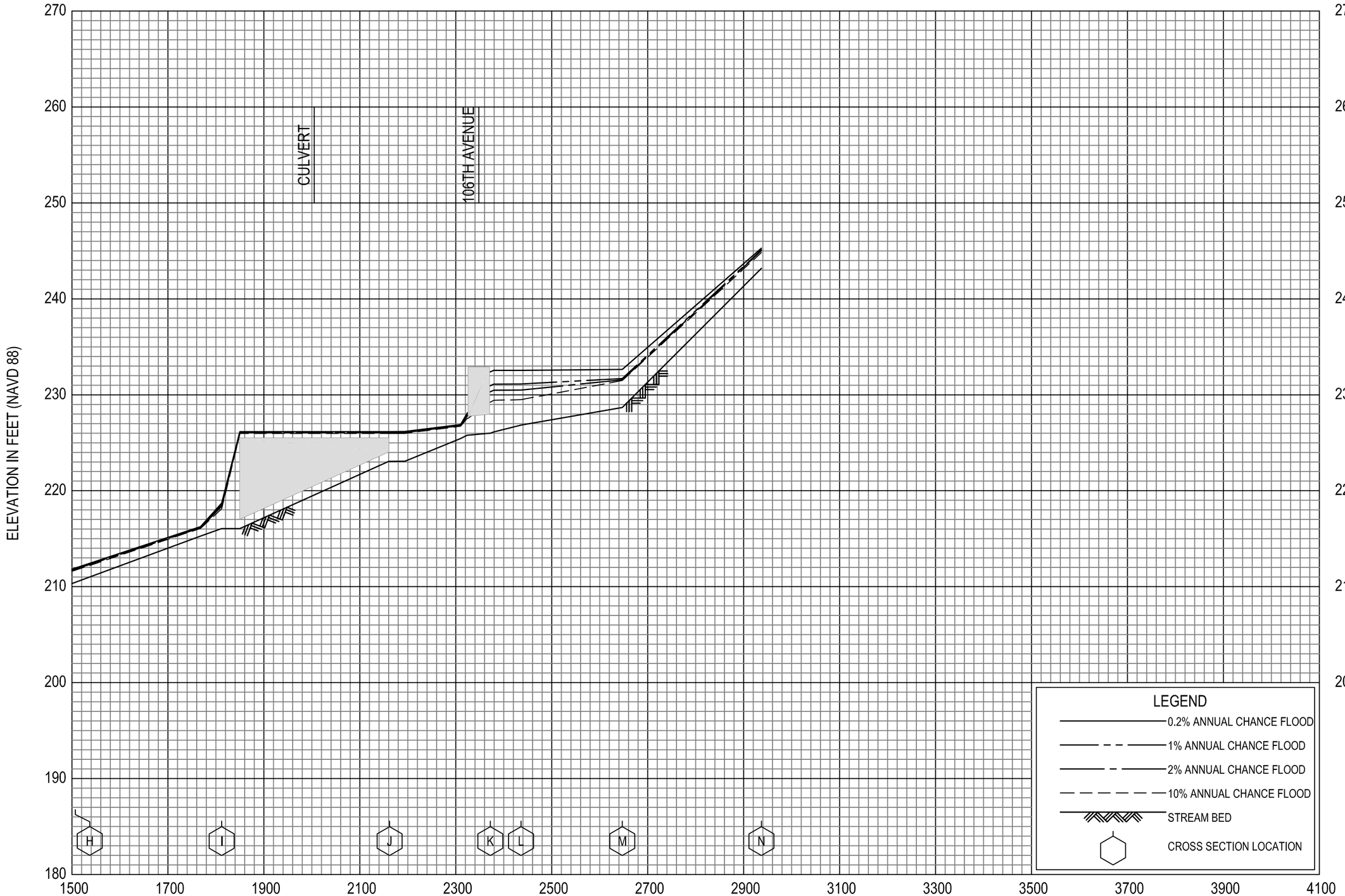


FLOOD PROFILES

HALL CREEK - 106TH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



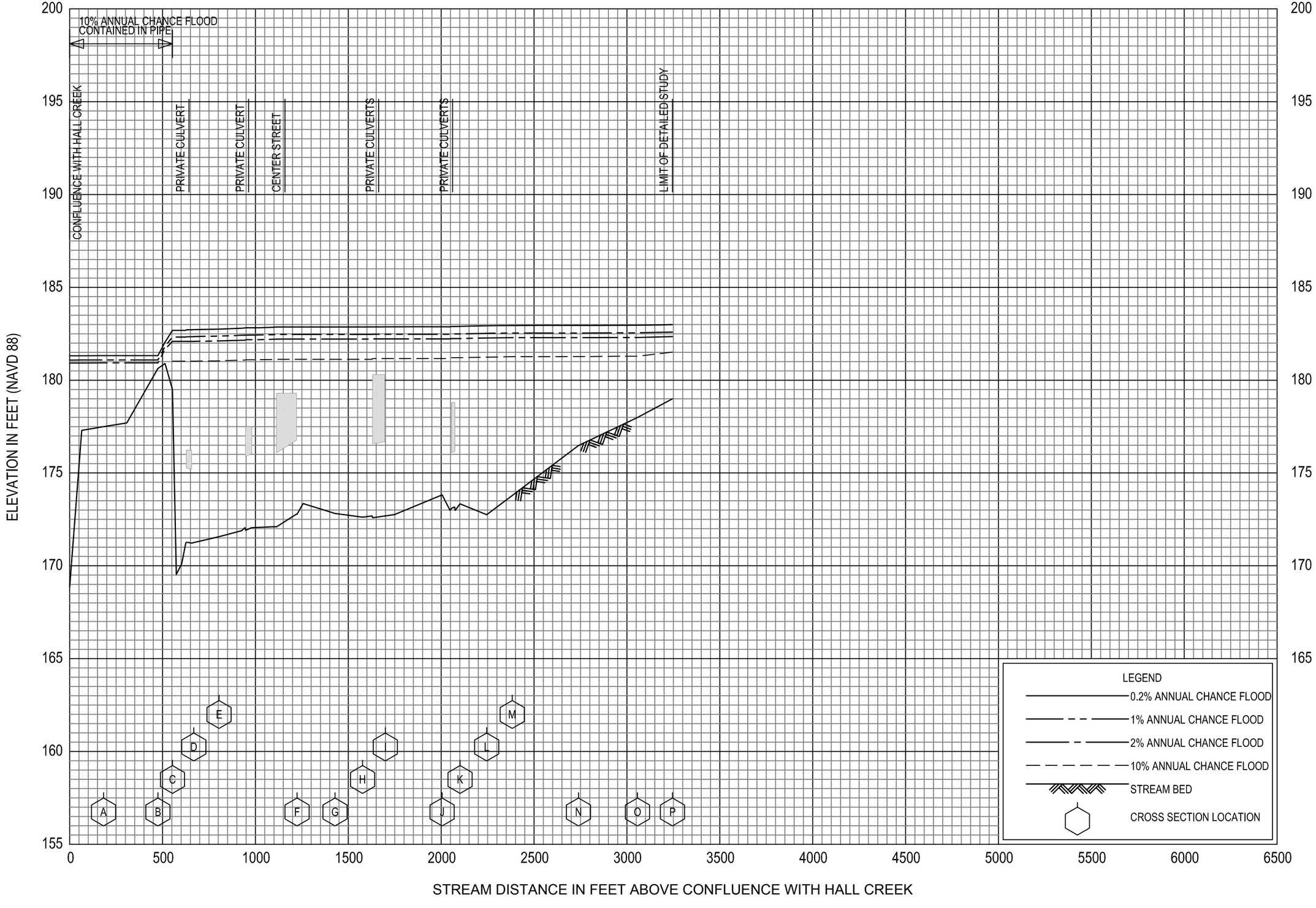
FLOOD PROFILES

HALL CREEK - 106TH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

77P



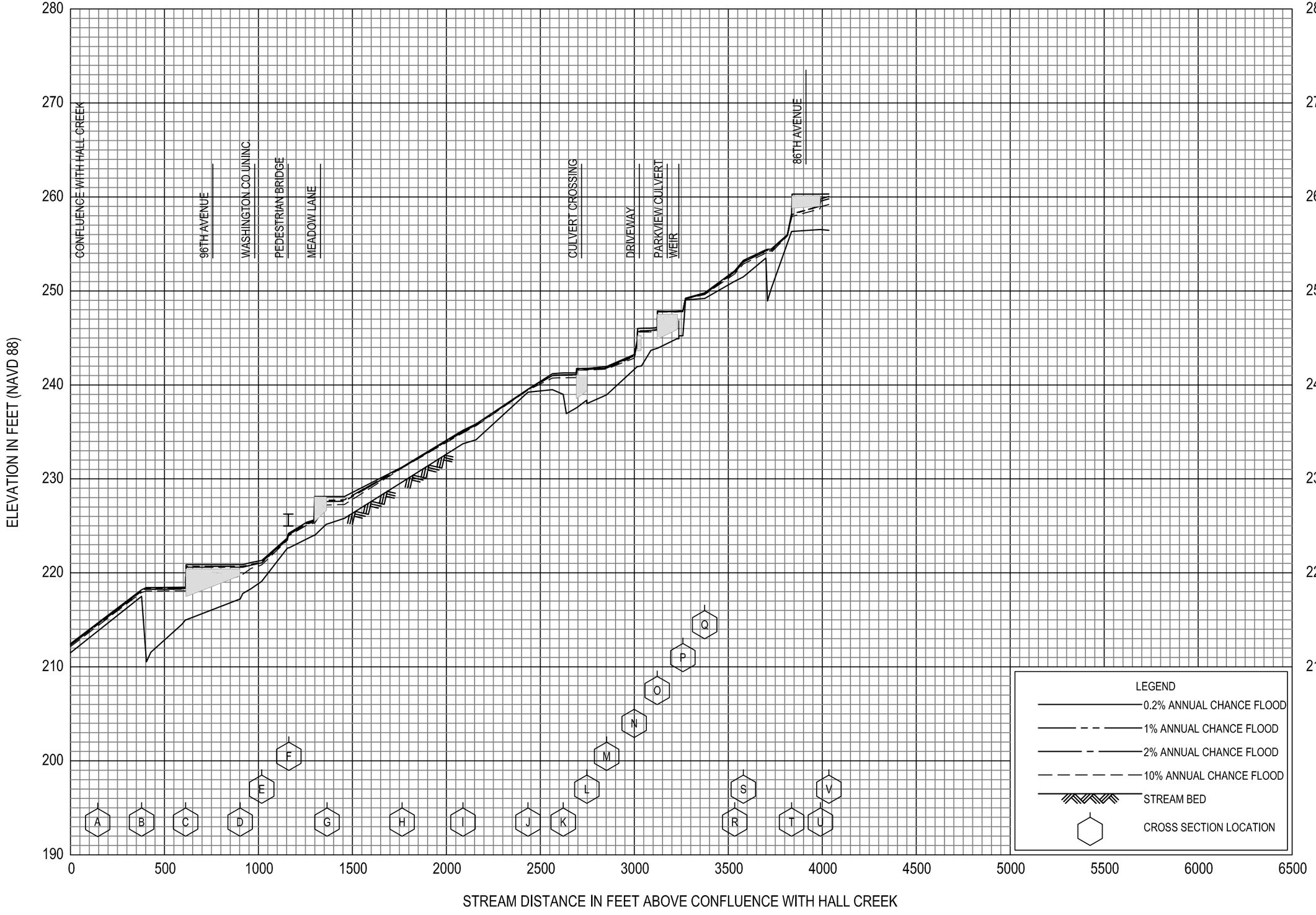
FLOOD PROFILES

HALL CREEK - NORTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(AND INCORPORATED AREAS)

78P



FLOOD PROFILES

HALL CREEK - SOUTH FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
(AND INCORPORATED AREAS)

FLOOD PROFILES

HEDGES CREEK

BACKWATER FROM TUALATIN RIVER

CONFLUENCE WITH TUALATIN RIVER

FOOTPATH/CULVERT

FOOTBRIDGE

FOOTPATH/CULVERT

SW TUALATIN RD - SW 86TH AVE

FOOTBRIDGE

SW 90TH AVENUE

ELEVATION IN FEET (NAVD 88)

145
140
135
130
125
120
115
110
105
100

0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH TUALATIN RIVER

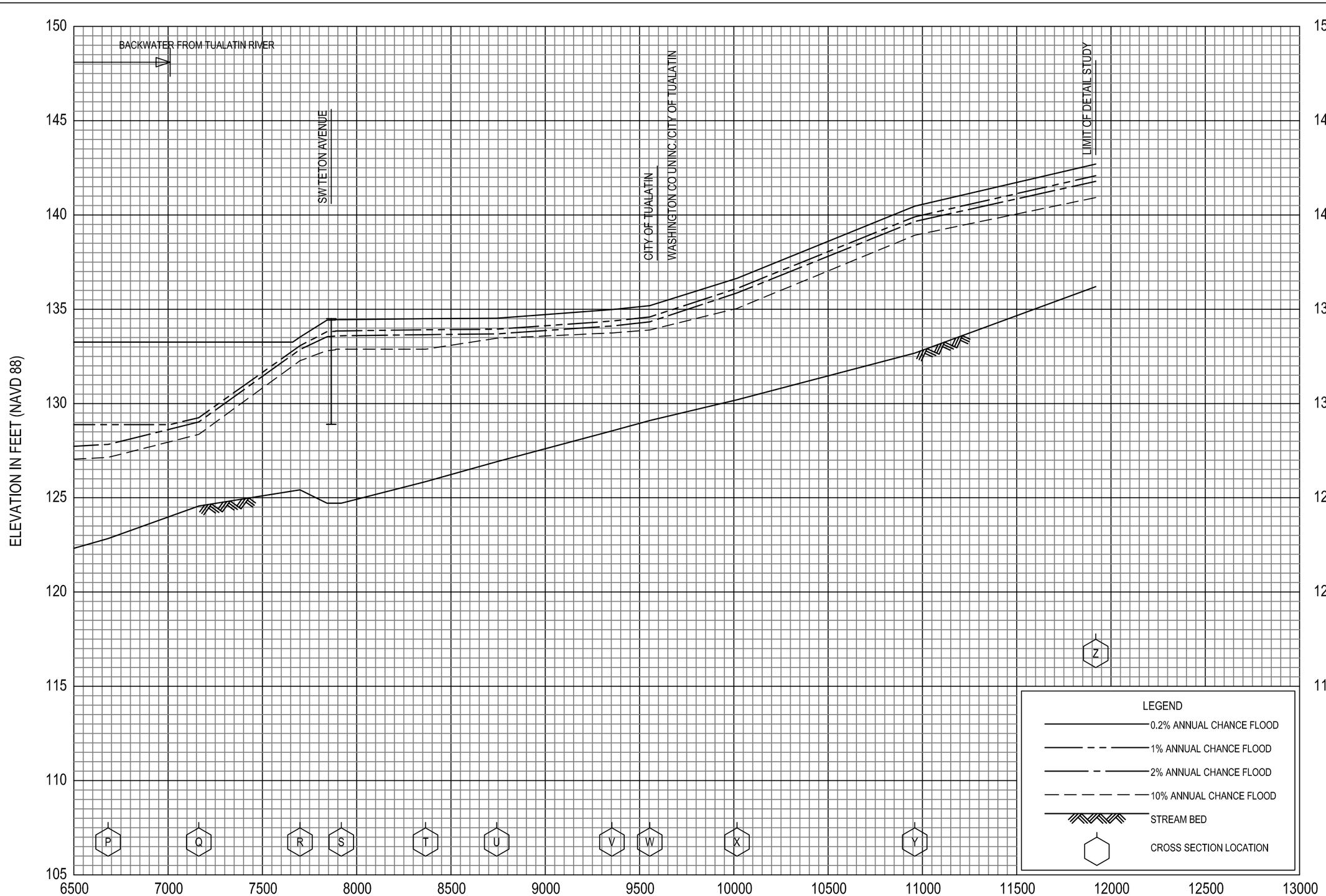
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

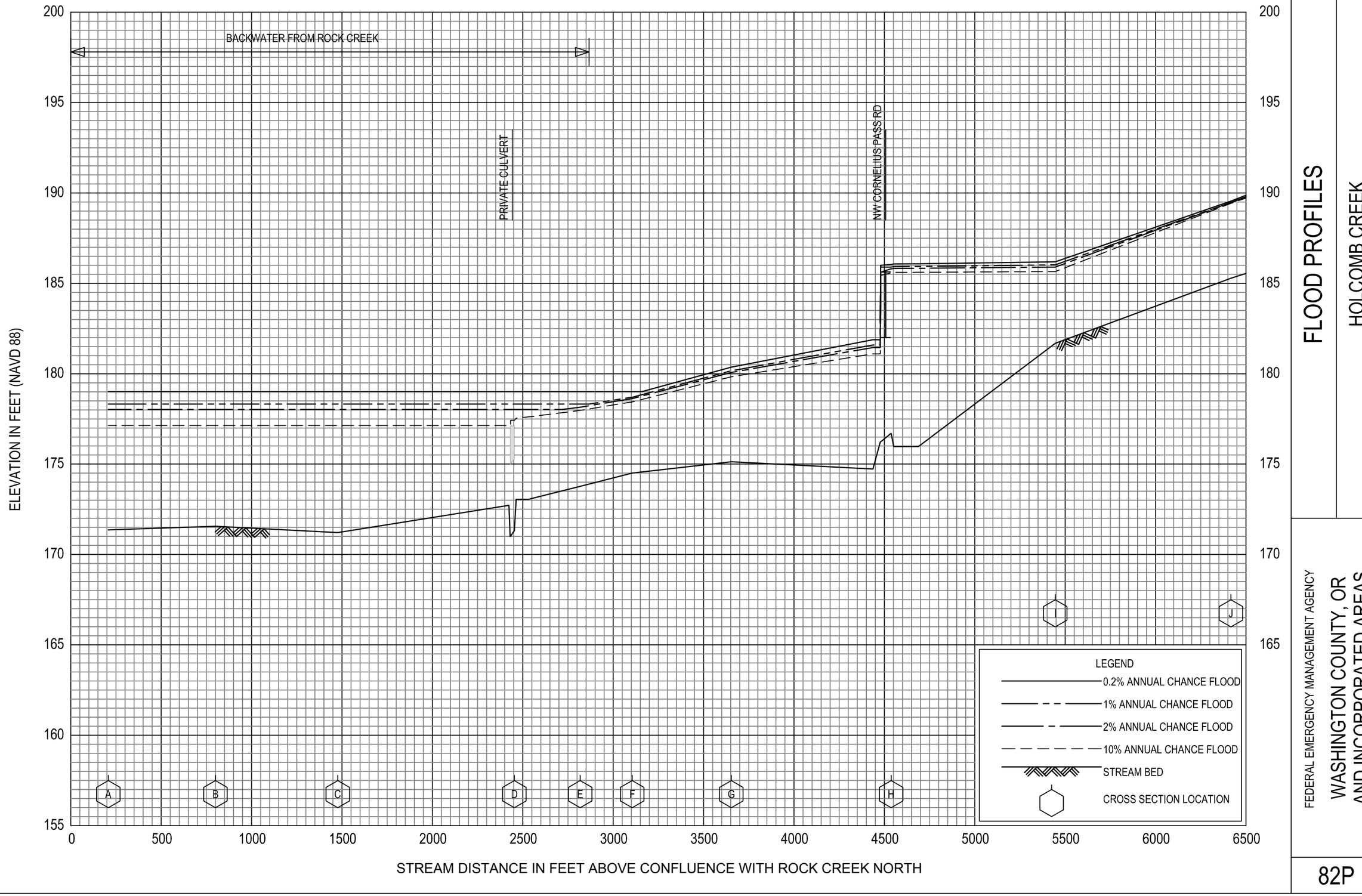


FLOOD PROFILES

HEDGES CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



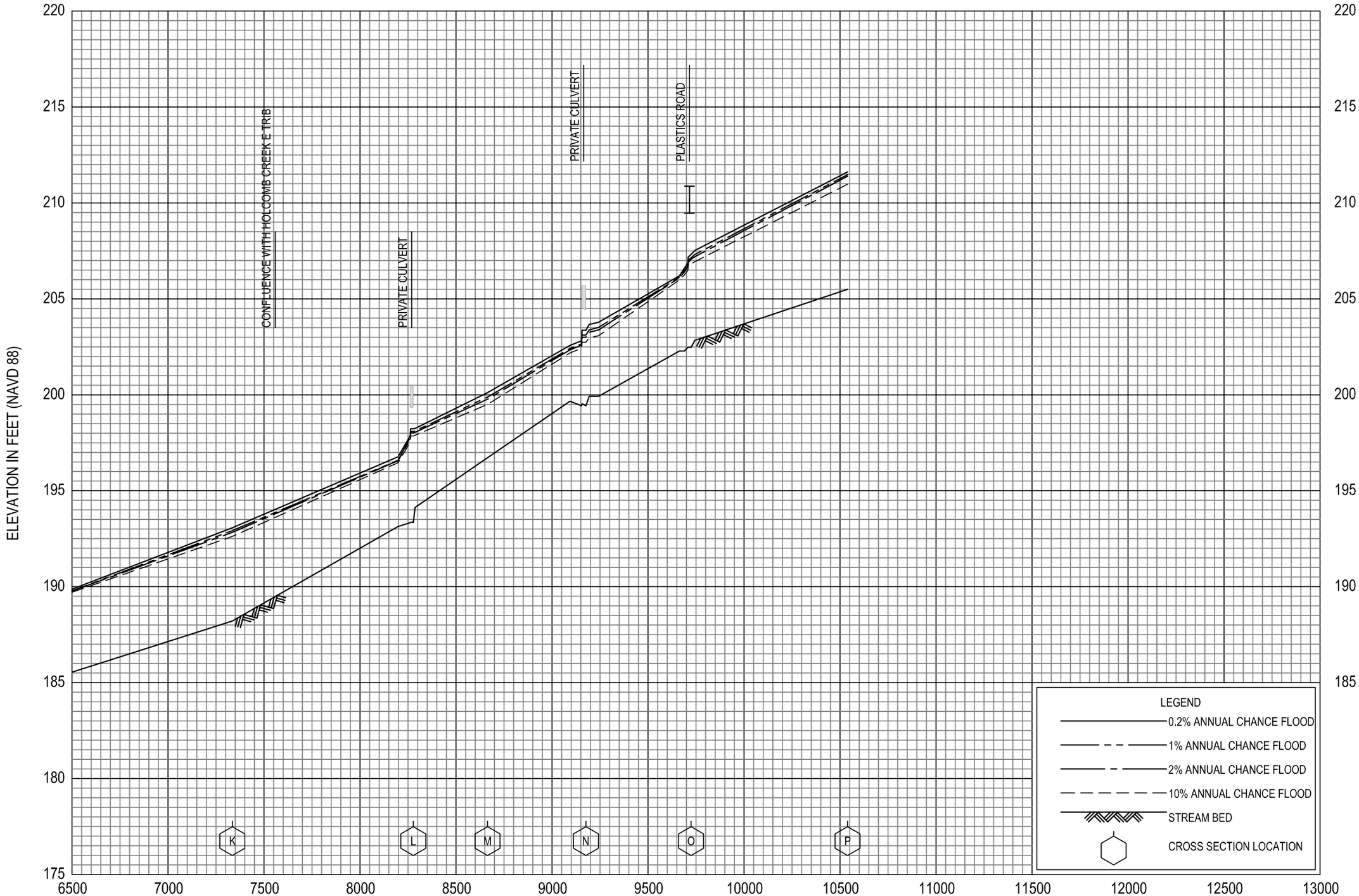
FLOOD PROFILES

HOLCOMB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

82P



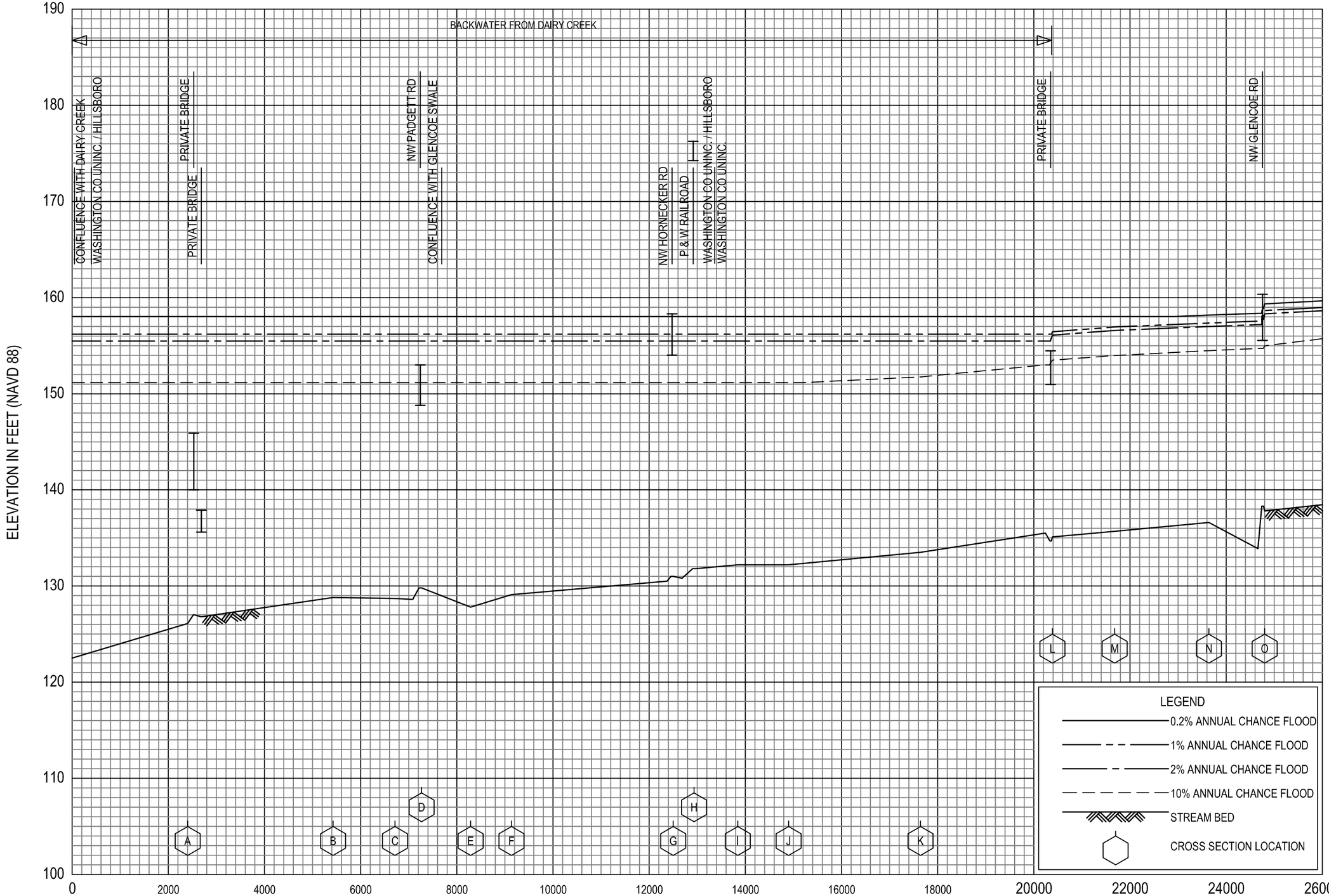
FLOOD PROFILES

HOLCOMB CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

83P



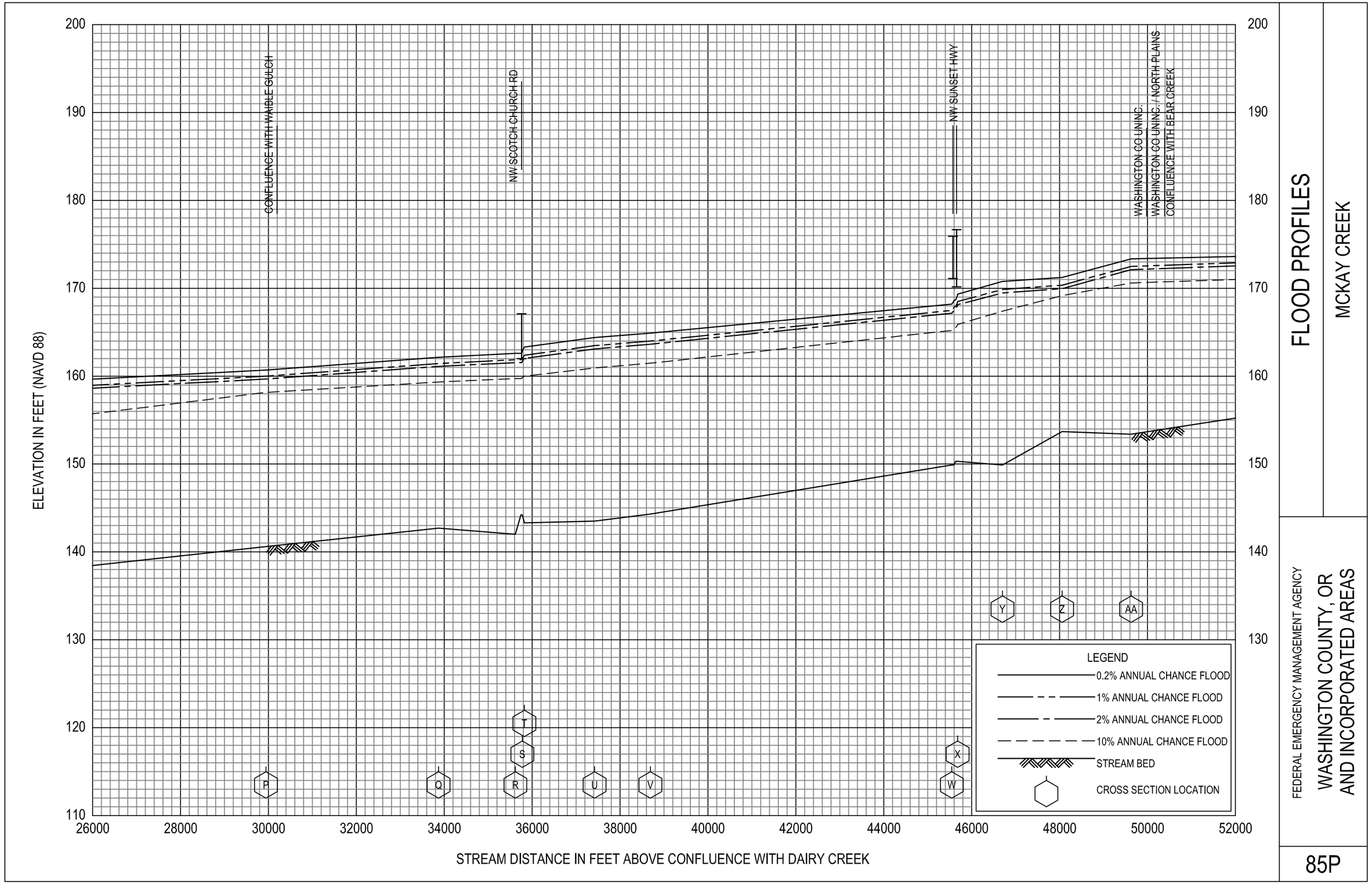
FLOOD PROFILES

MCKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

84P



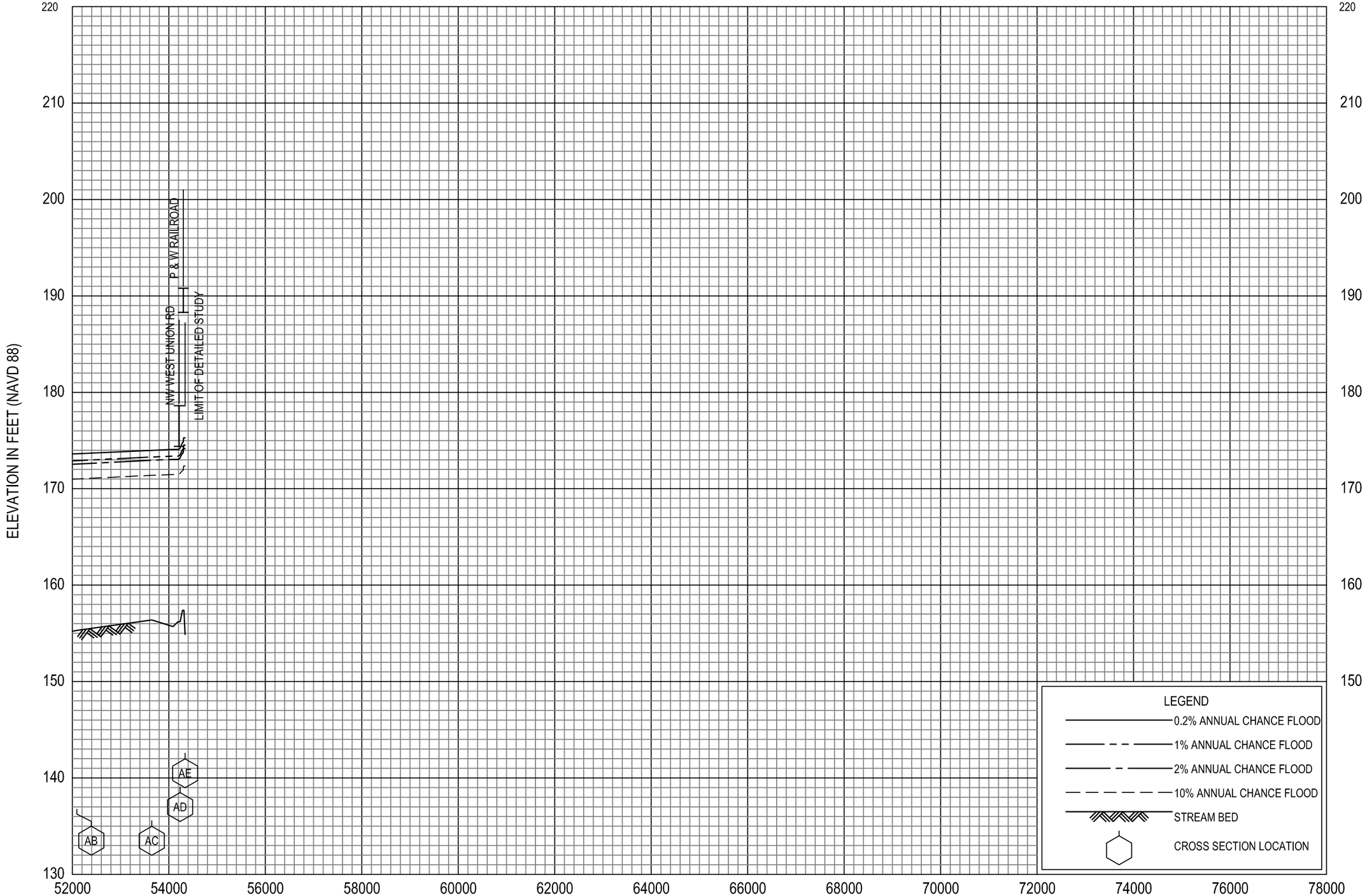
FLOOD PROFILES

MCKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

85P



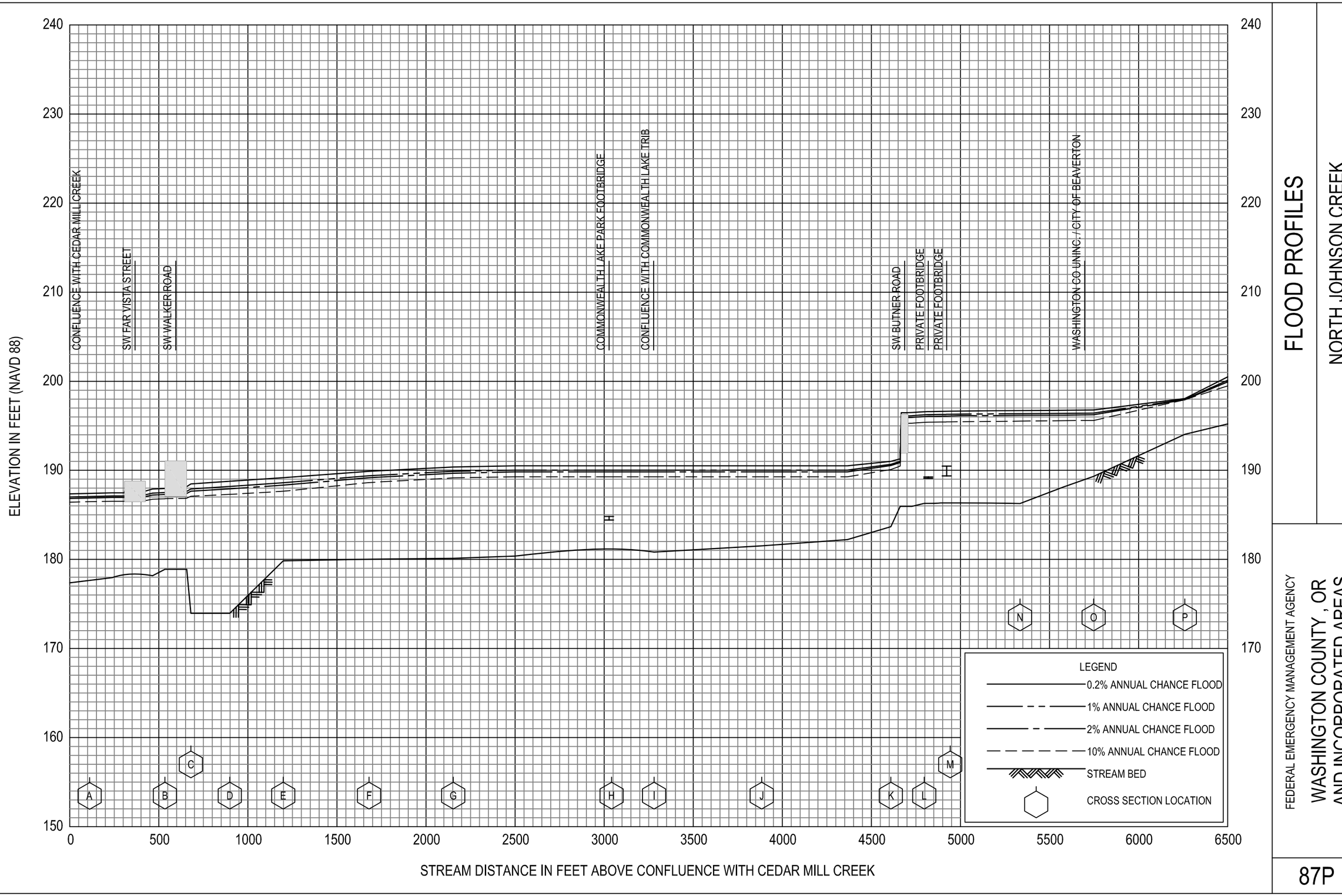
FLOOD PROFILES

MCKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

86P



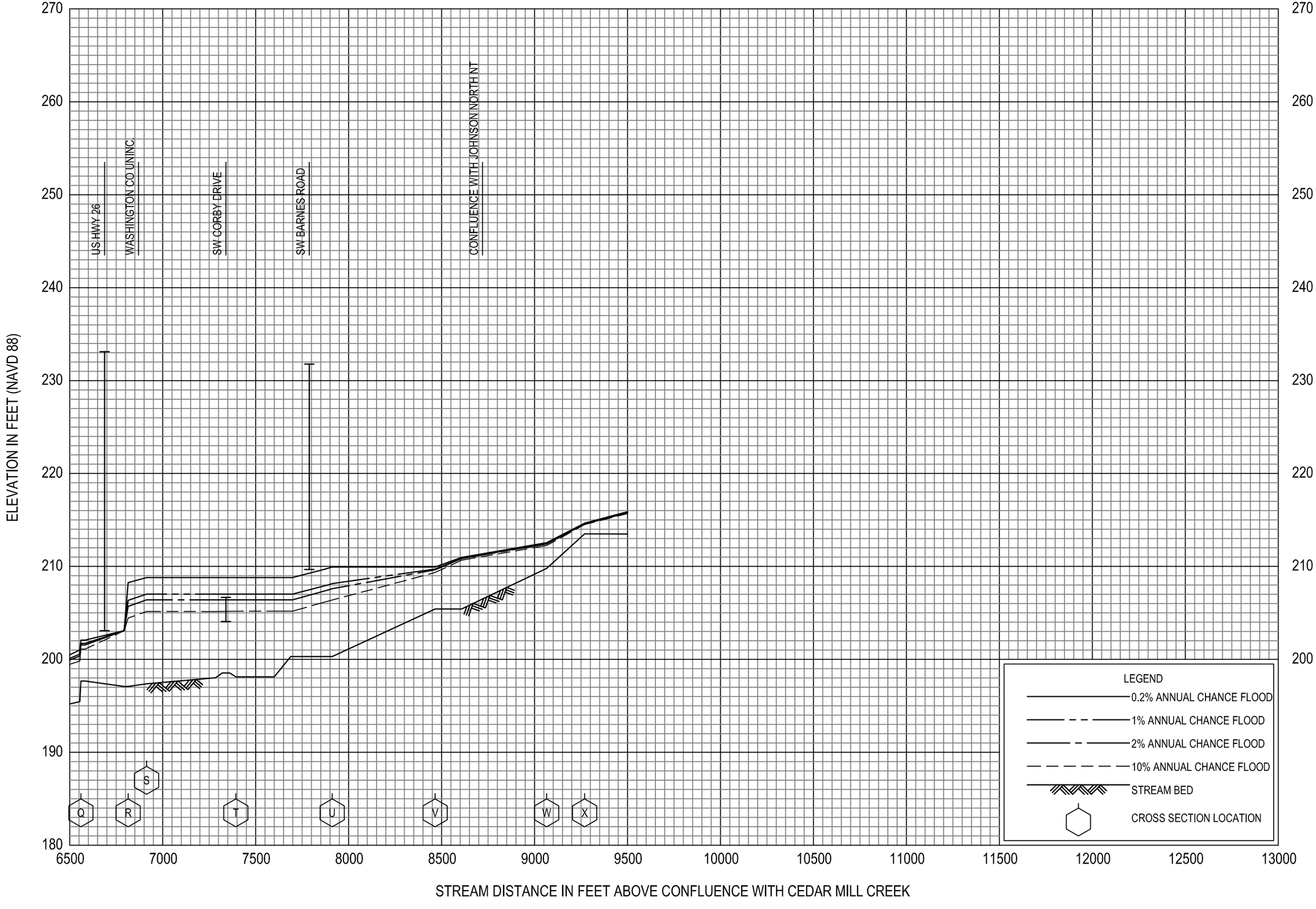
FLOOD PROFILES

NORTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

87P



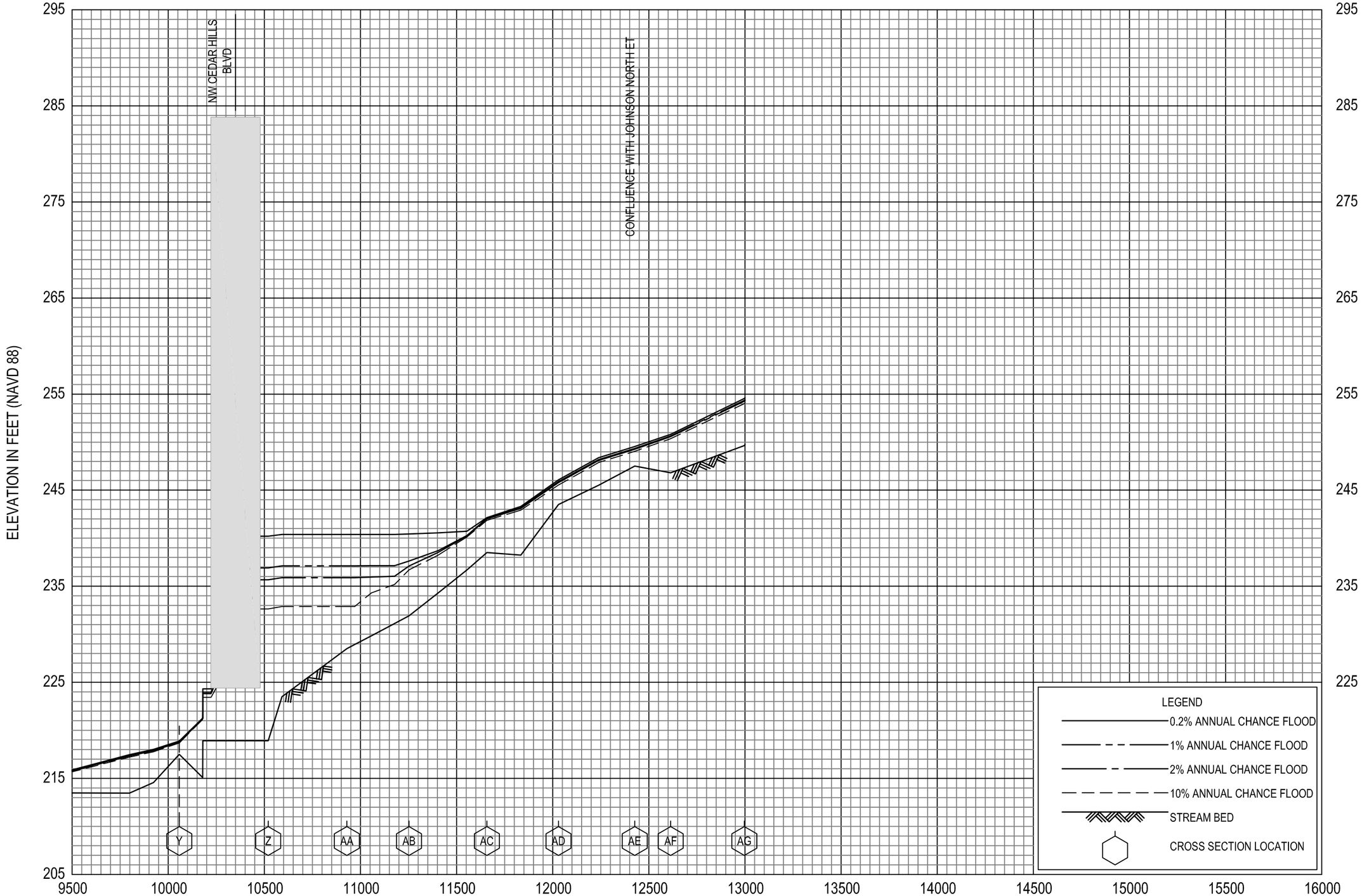
FLOOD PROFILES

NORTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

88P

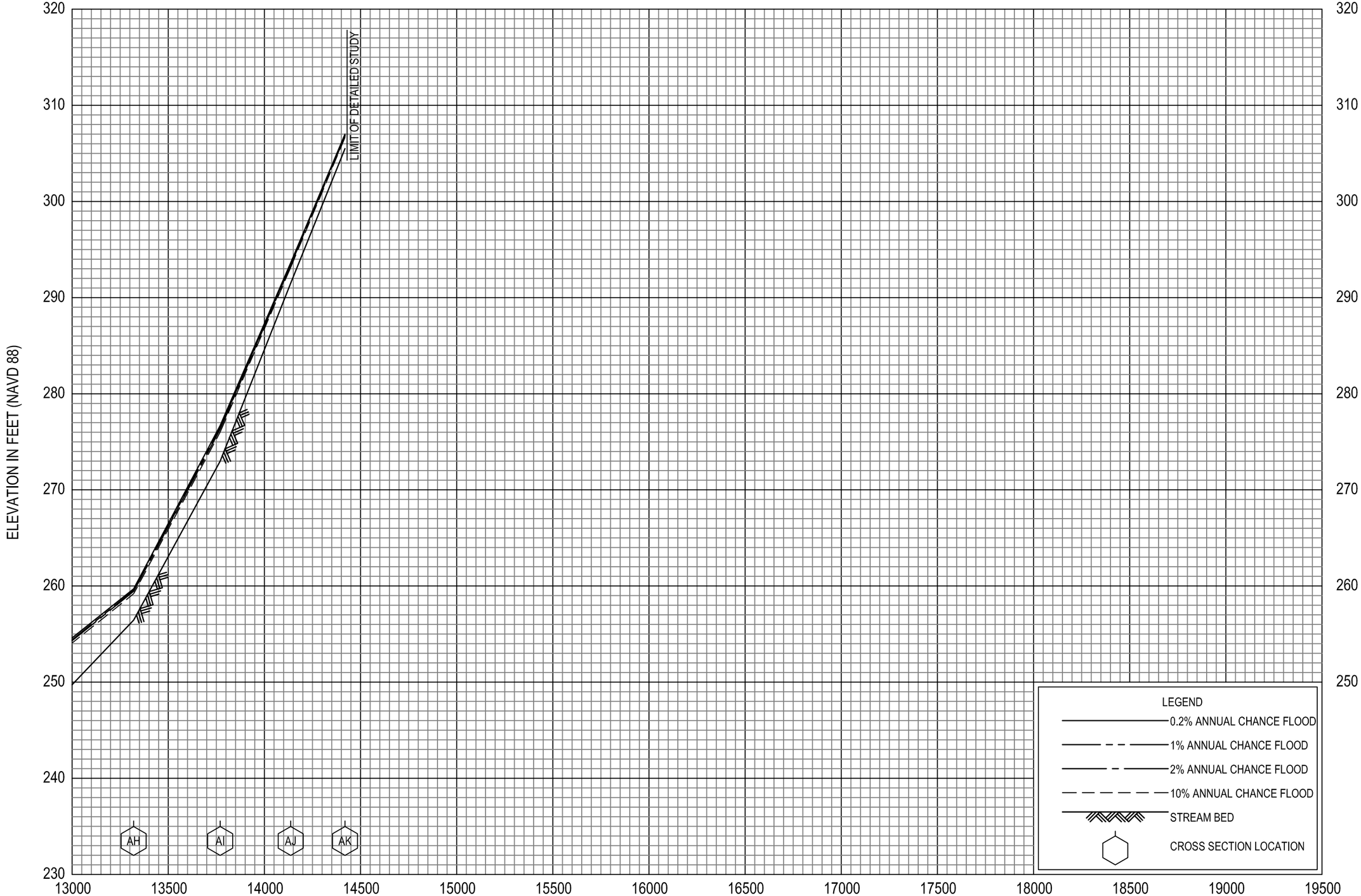


FLOOD PROFILES

NORTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

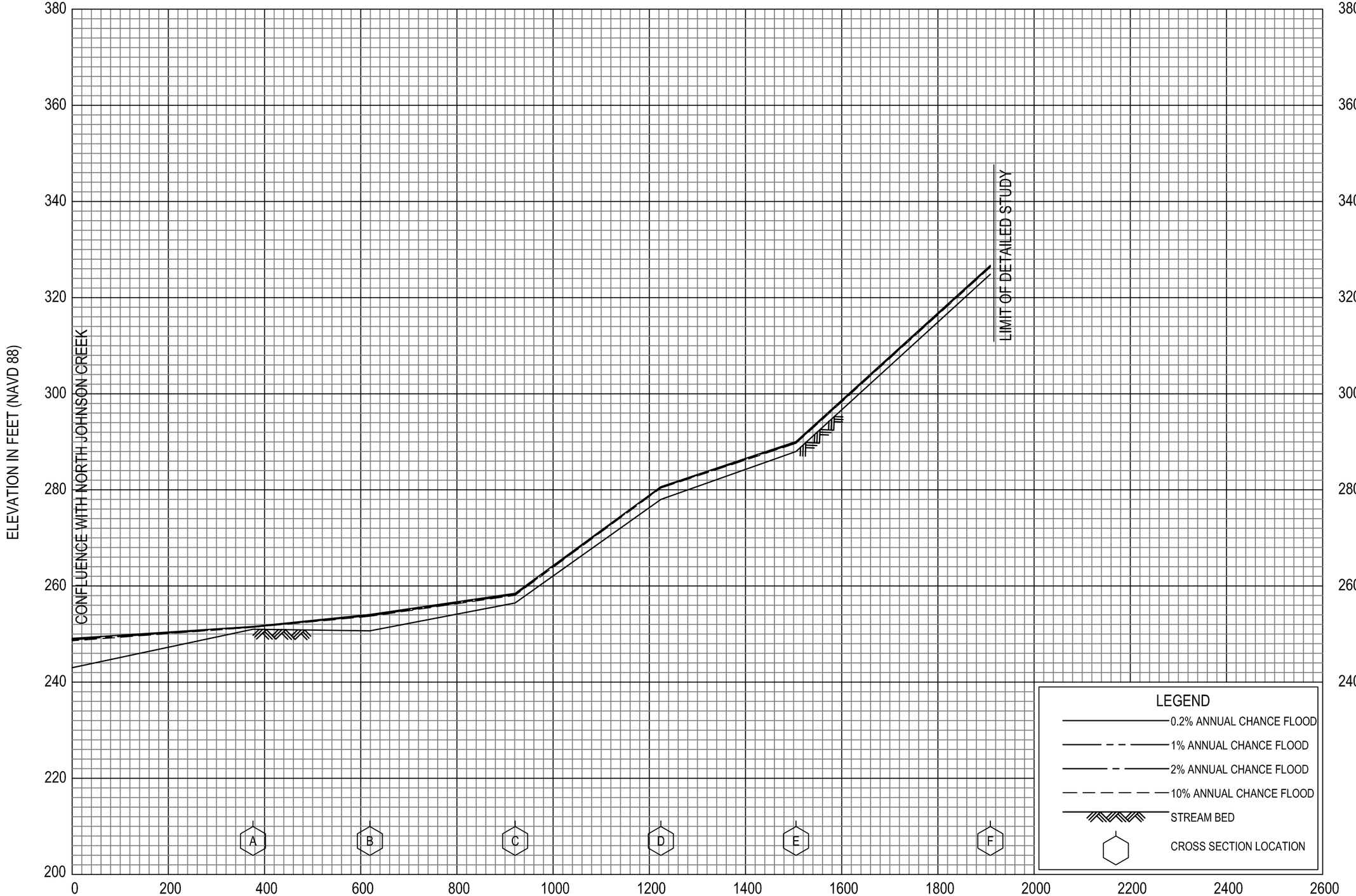


FLOOD PROFILES

NORTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



FLOOD PROFILES

NORTH JOHNSON CREEK - EAST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

ELEVATION IN FEET (NAVD 88)

340
320
300
280
260
240
220
200
180
160

CONFLUENCE WITH NORTH JOHNSON CREEK

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH NORTH JOHNSON CREEK

A
B
C

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

NORTH JOHNSON CREEK - NORTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

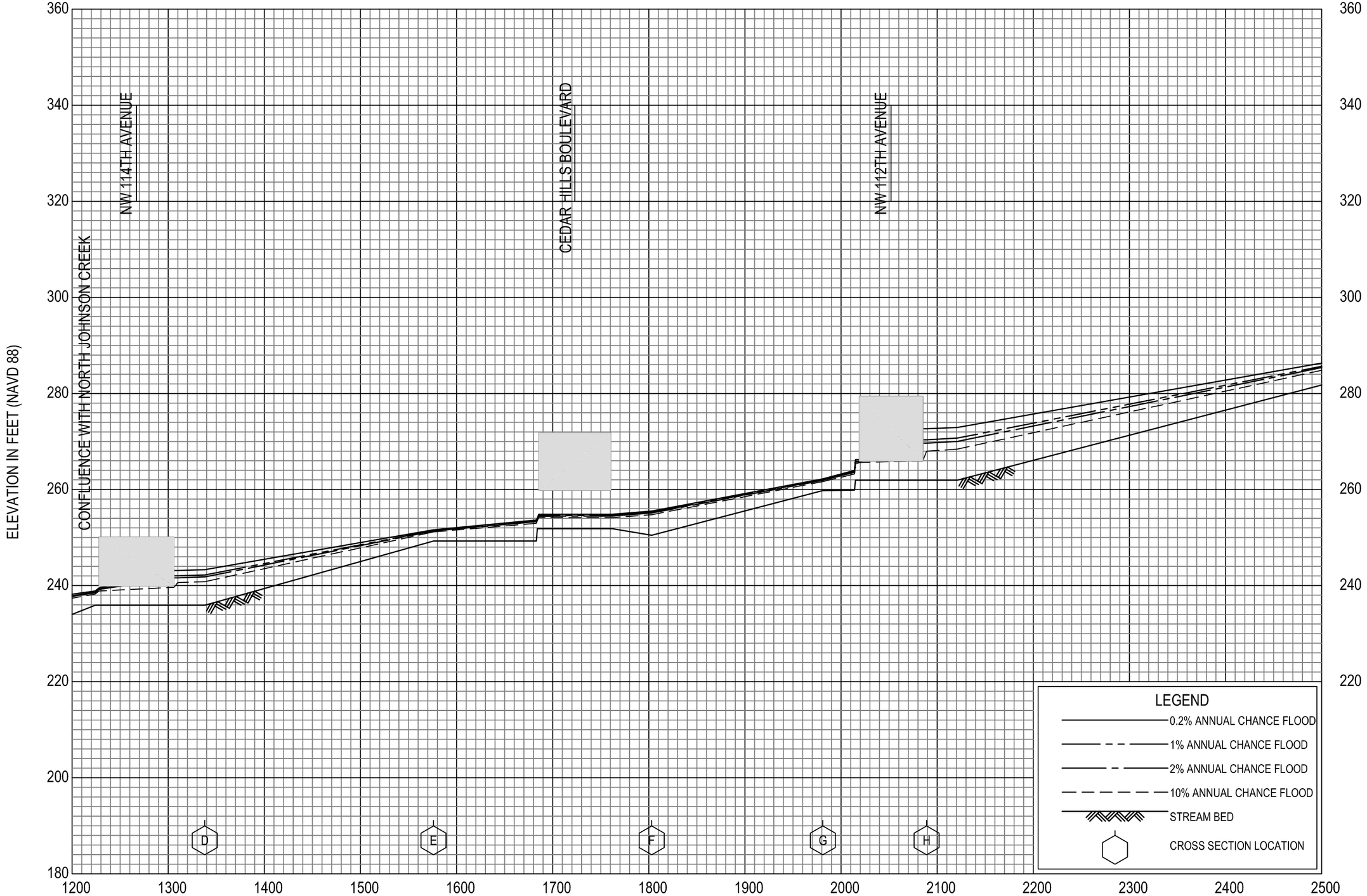
92P

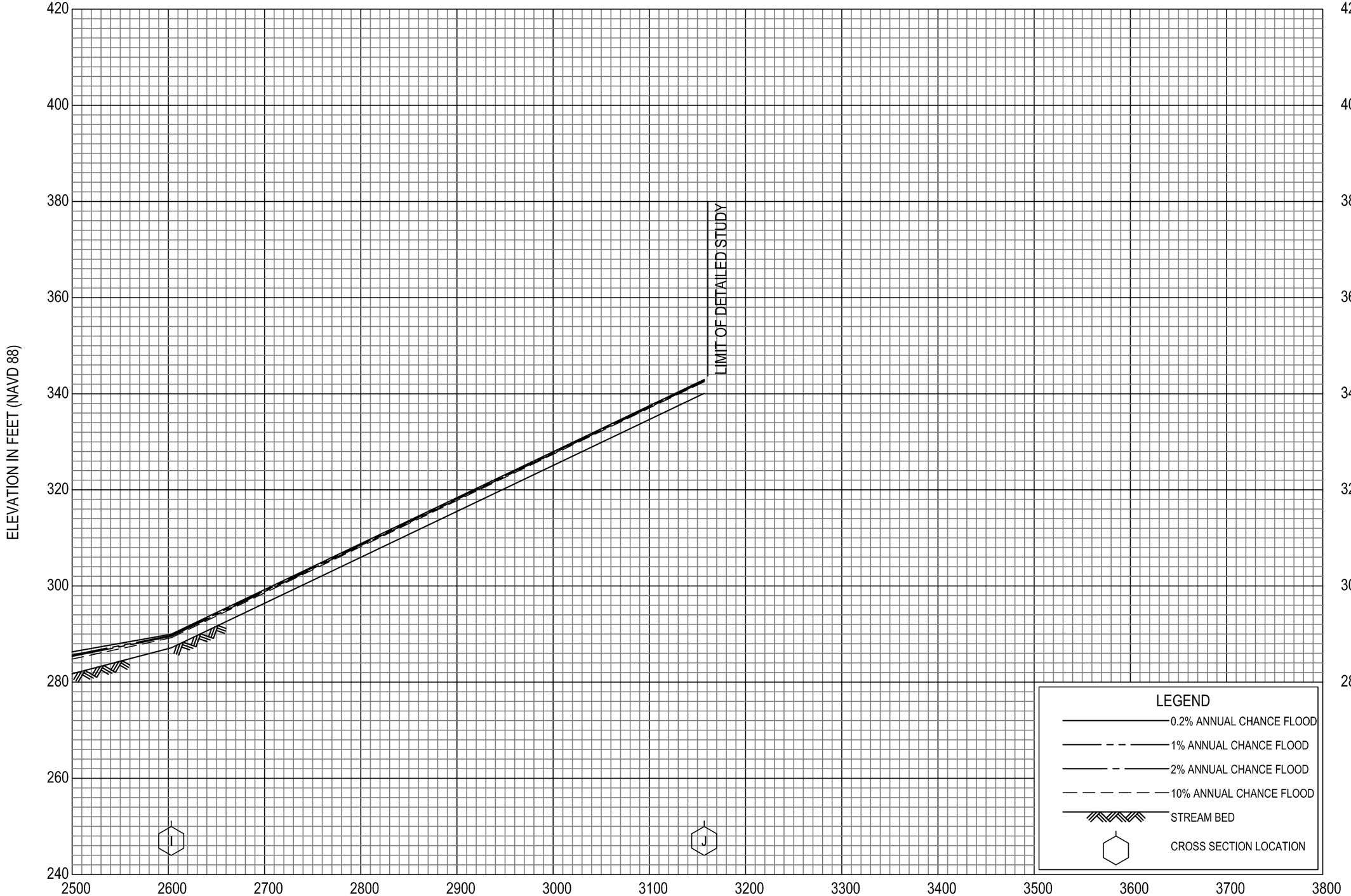
FLOOD PROFILES

NORTH JOHNSON CREEK - NORTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS





FLOOD PROFILES

NORTH JOHNSON CREEK - NORTH TRIBUTARY

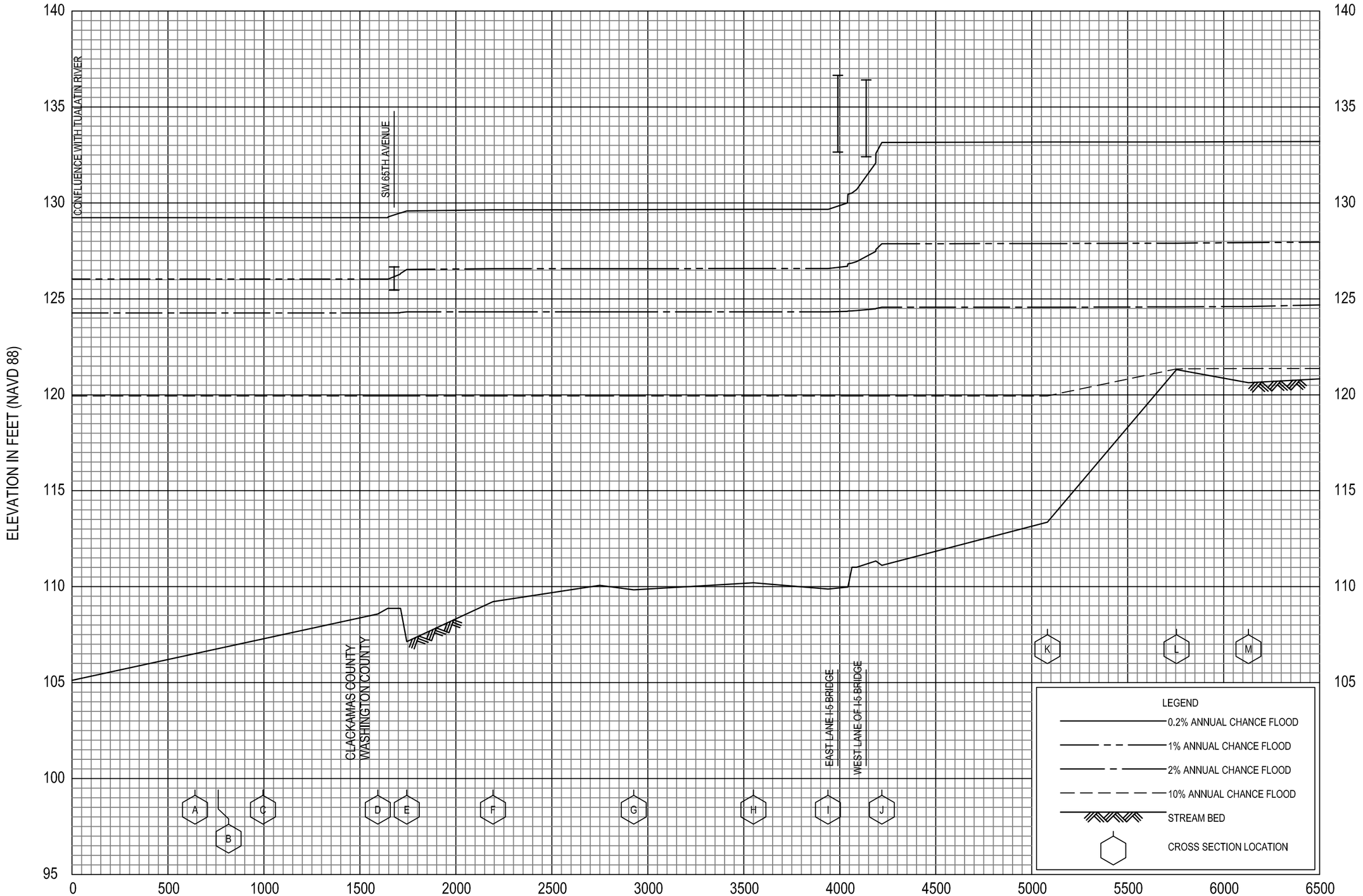
FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

94P

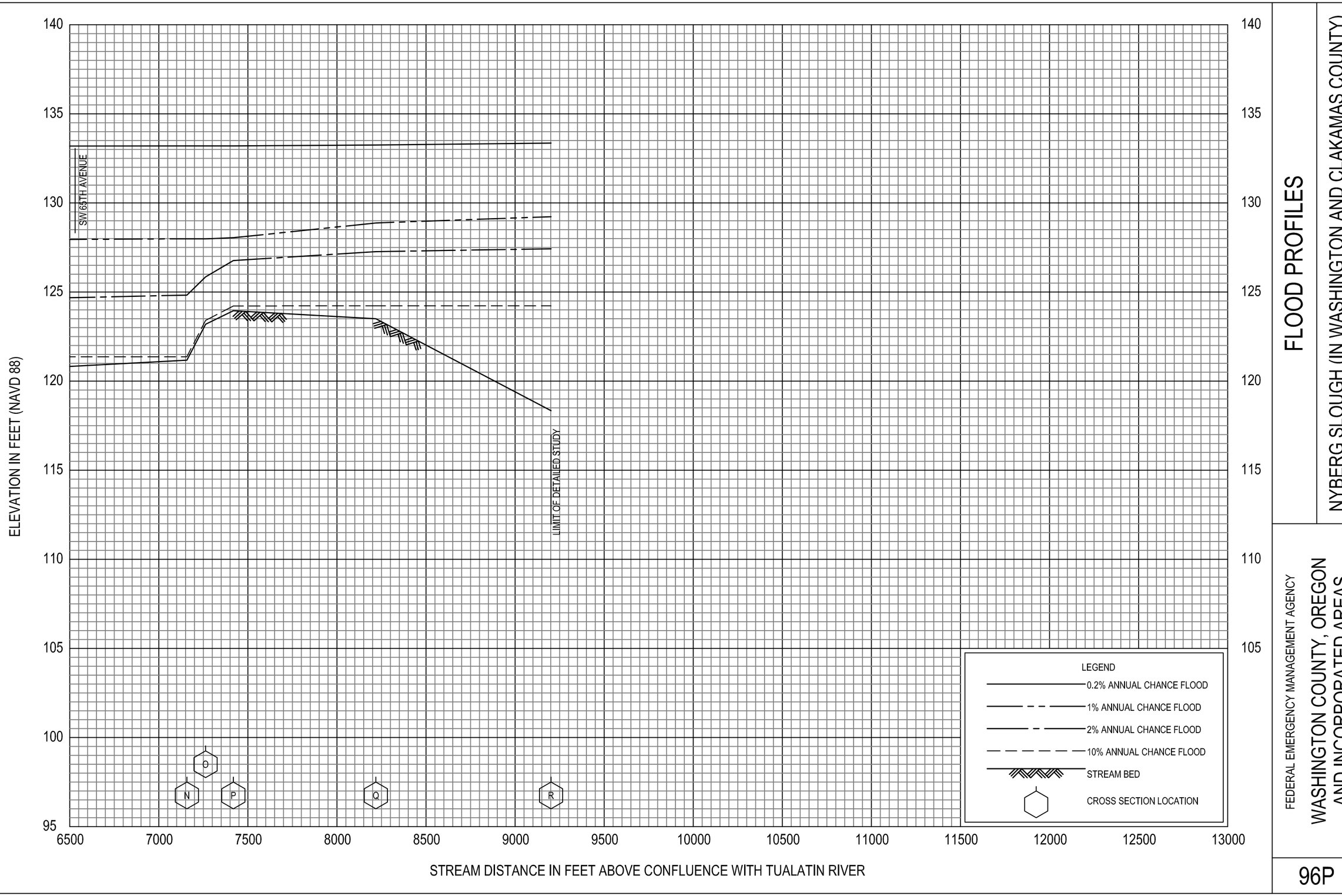
FLOOD PROFILES

NYBERG SLOUGH (IN WASHINGTON AND CLAKAMAS COUNTY)



FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OREGON
AND INCORPORATED AREAS



FLOOD PROFILES

NYBERG SLOUGH (IN WASHINGTON AND CLAKAMAS COUNTY)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

FLOOD PROFILES

ROCK CREEK NORTH

BACKWATER FROM TUALATIN RIVER

FOOTBRIDGE

PRIVATE BRIDGE

CITY OF HILLSBORO

SE RIVER RD

P & W RAILROAD

TUALATIN VALLEY HWY

CONFLUENCE WITH TURNER CREEK

CONFLUENCE WITH TUALATIN RIVER

ELEVATION IN FEET (NAVD 88)

170
160
150
140
130
120
110
100
90
80

0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH TUALATIN RIVER

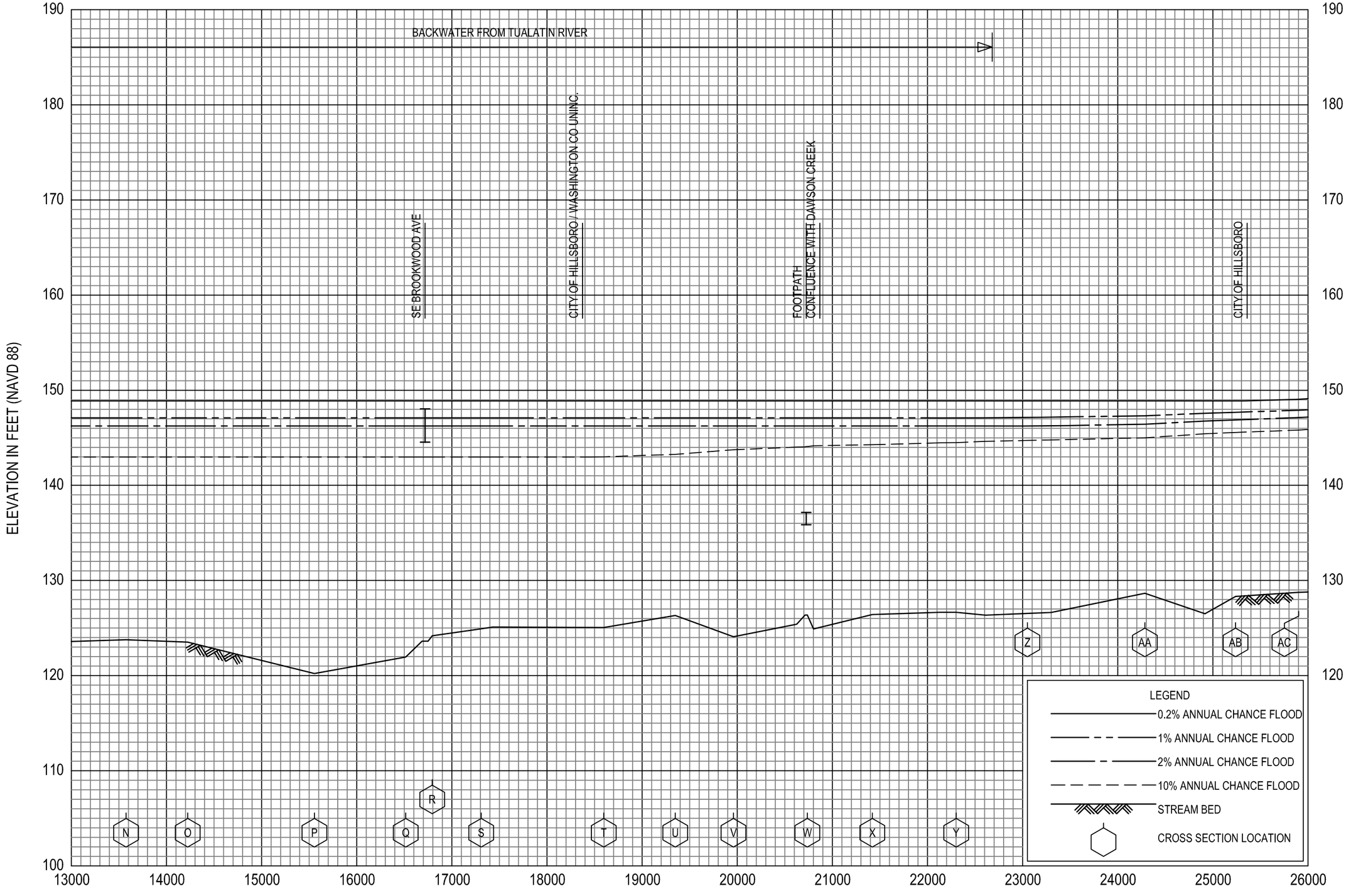
A B C D E F G H I J K L M

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



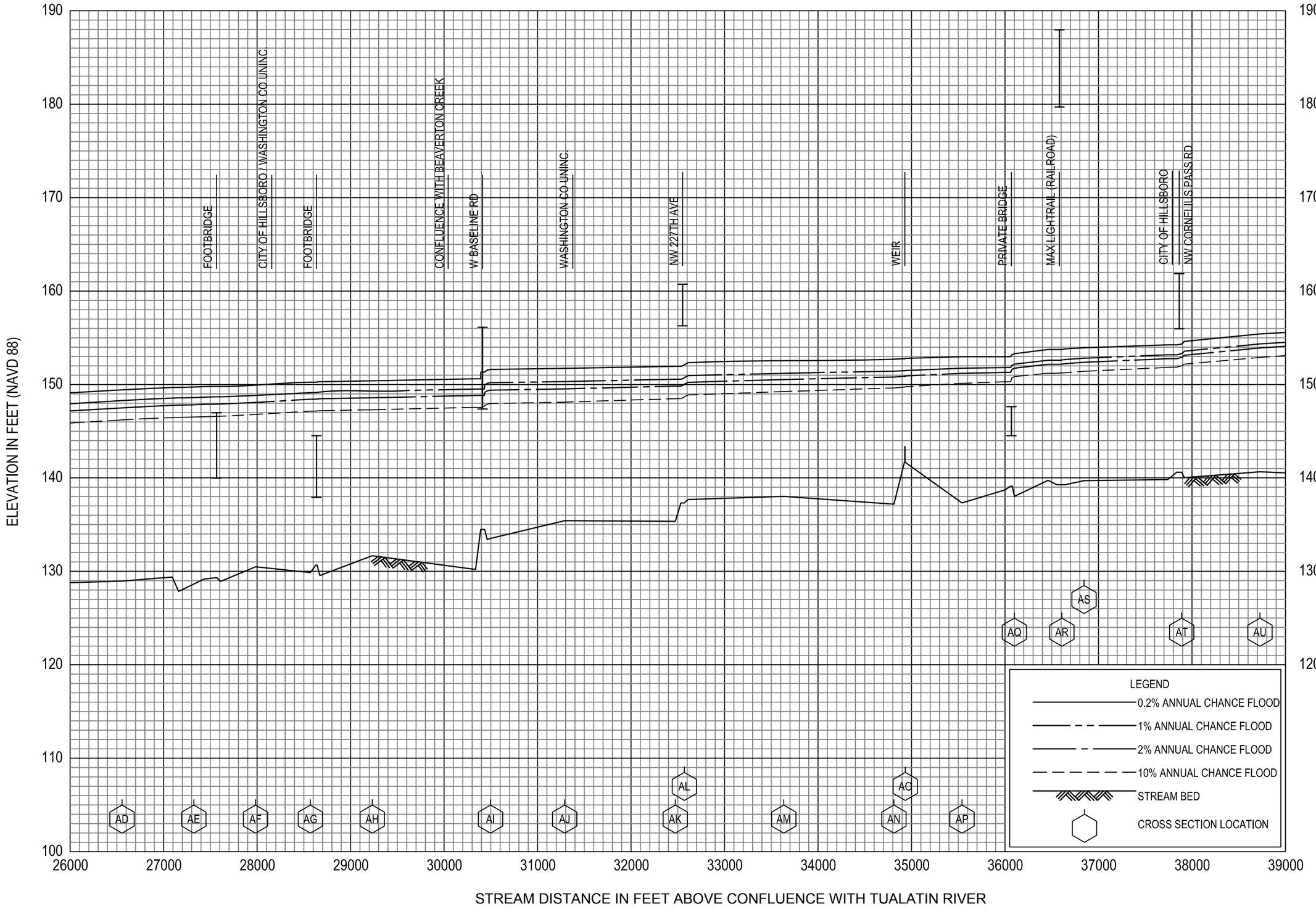
FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

98P

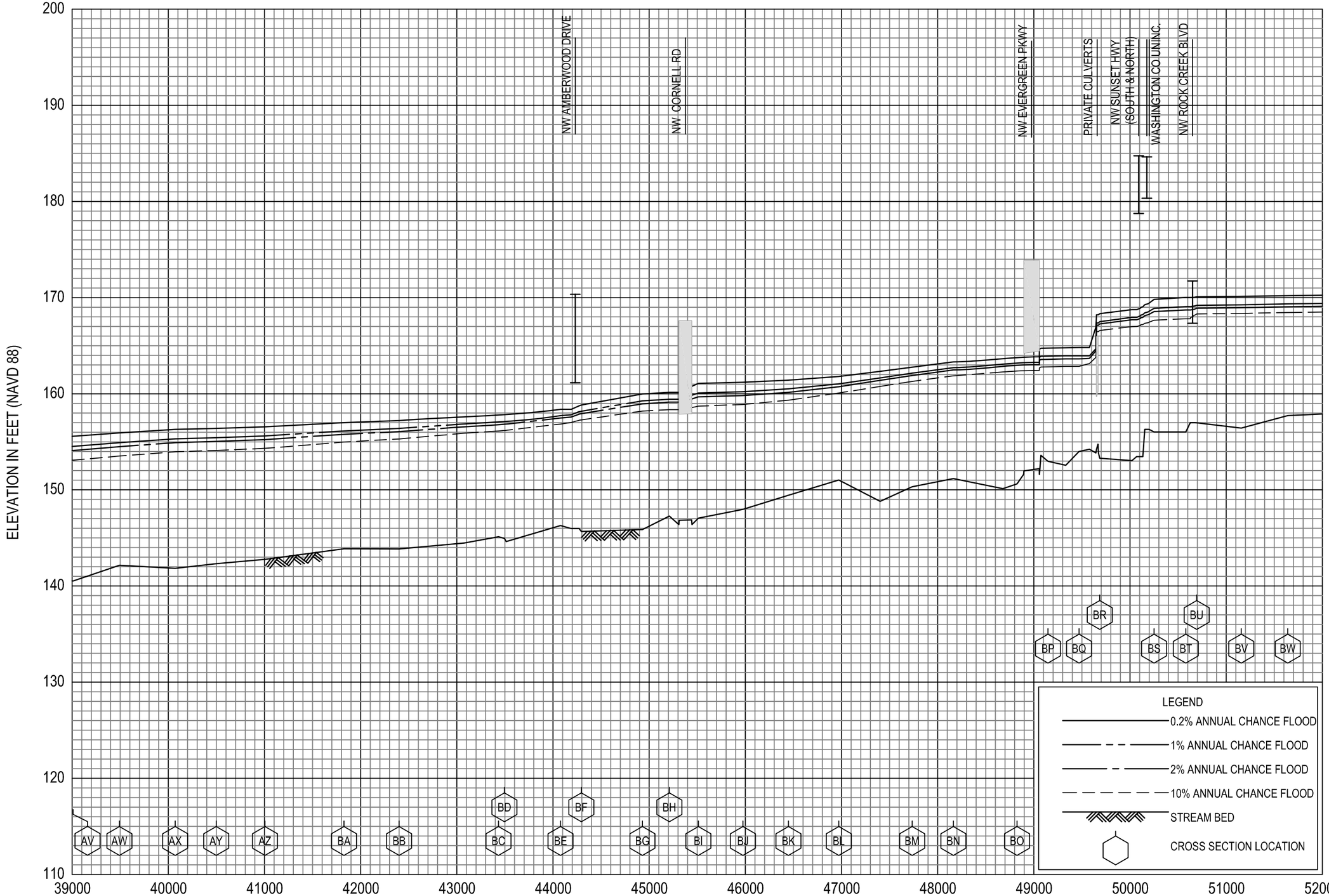


FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



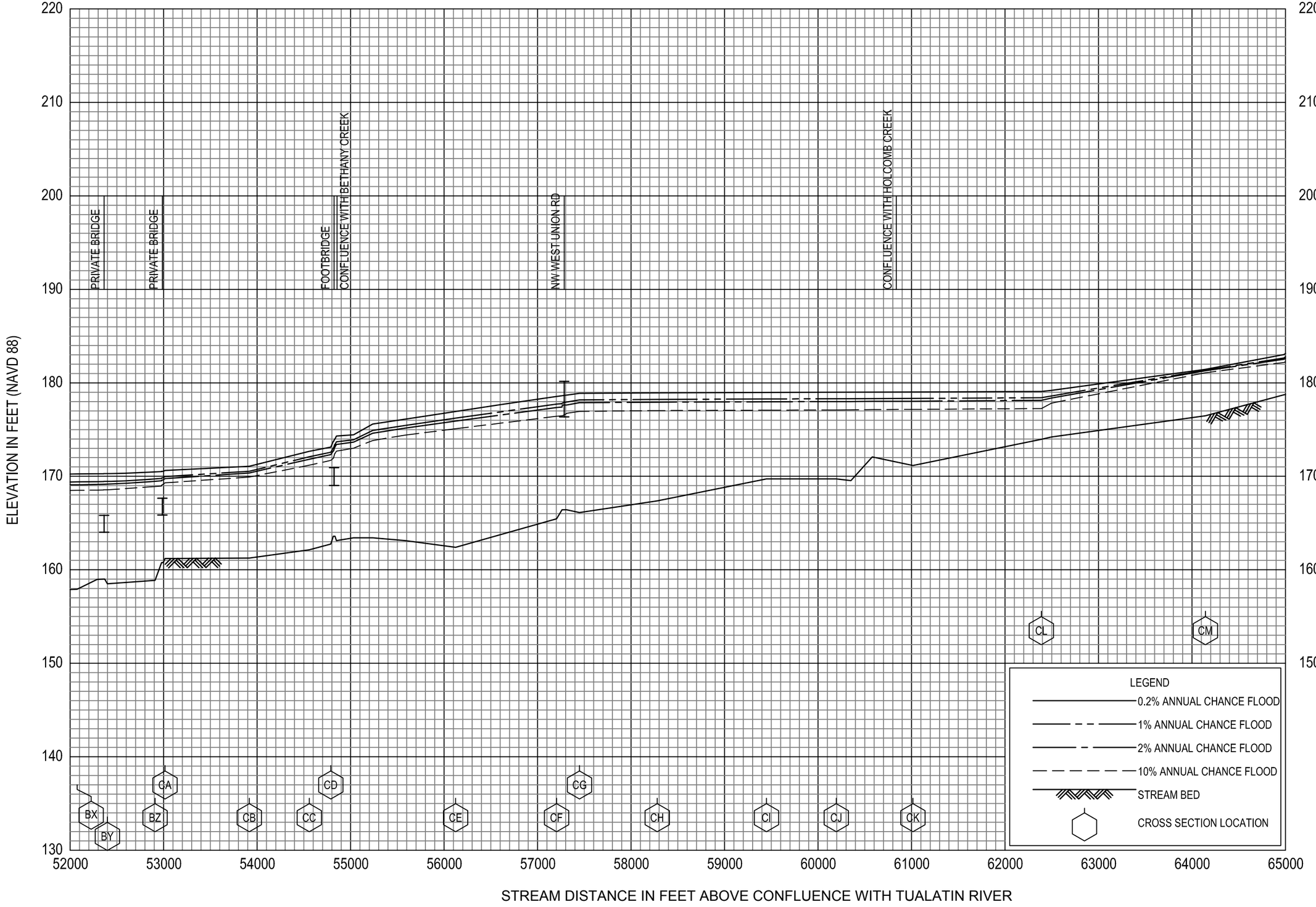
FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

100P



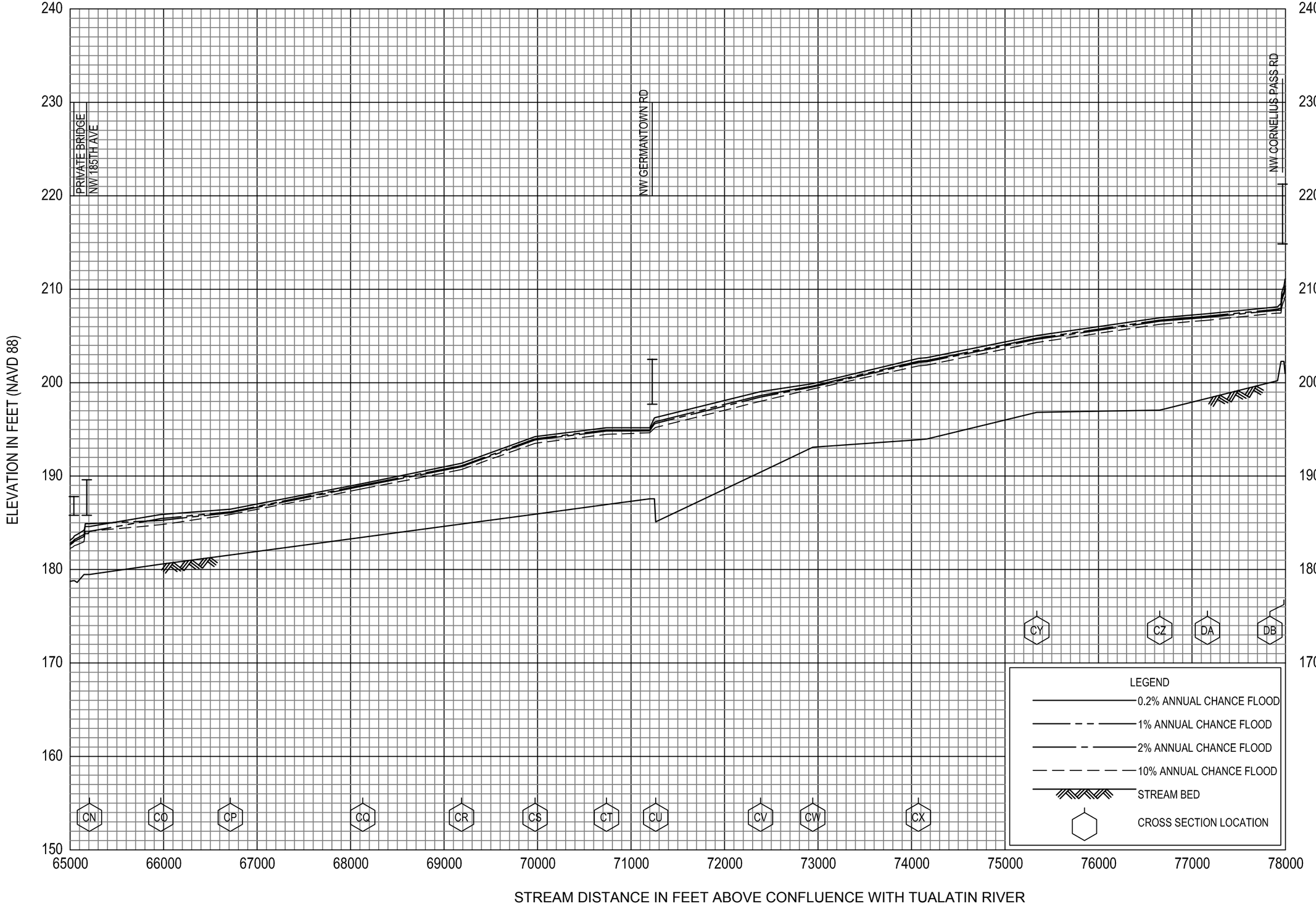
FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

101P



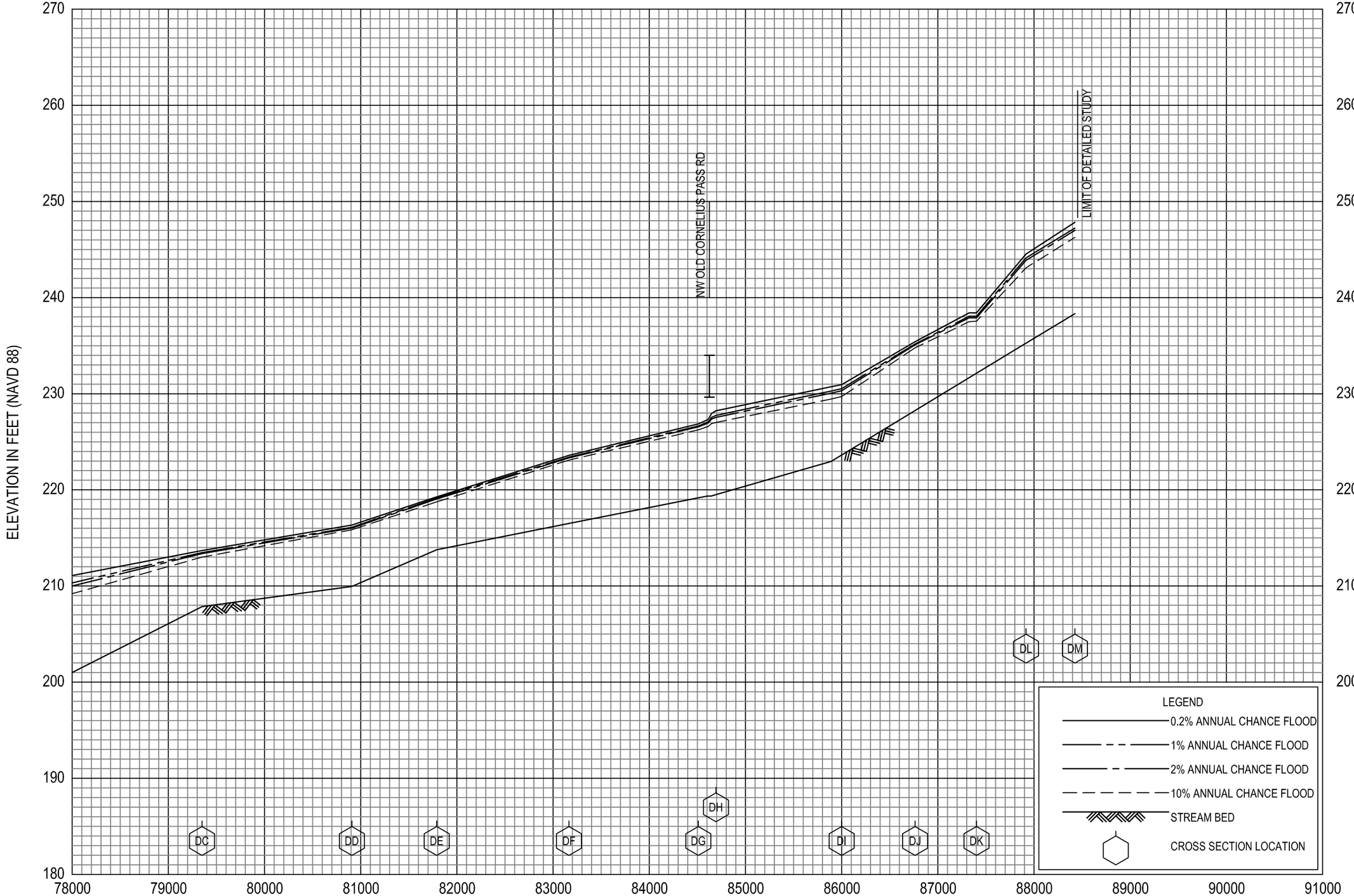
FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

102P



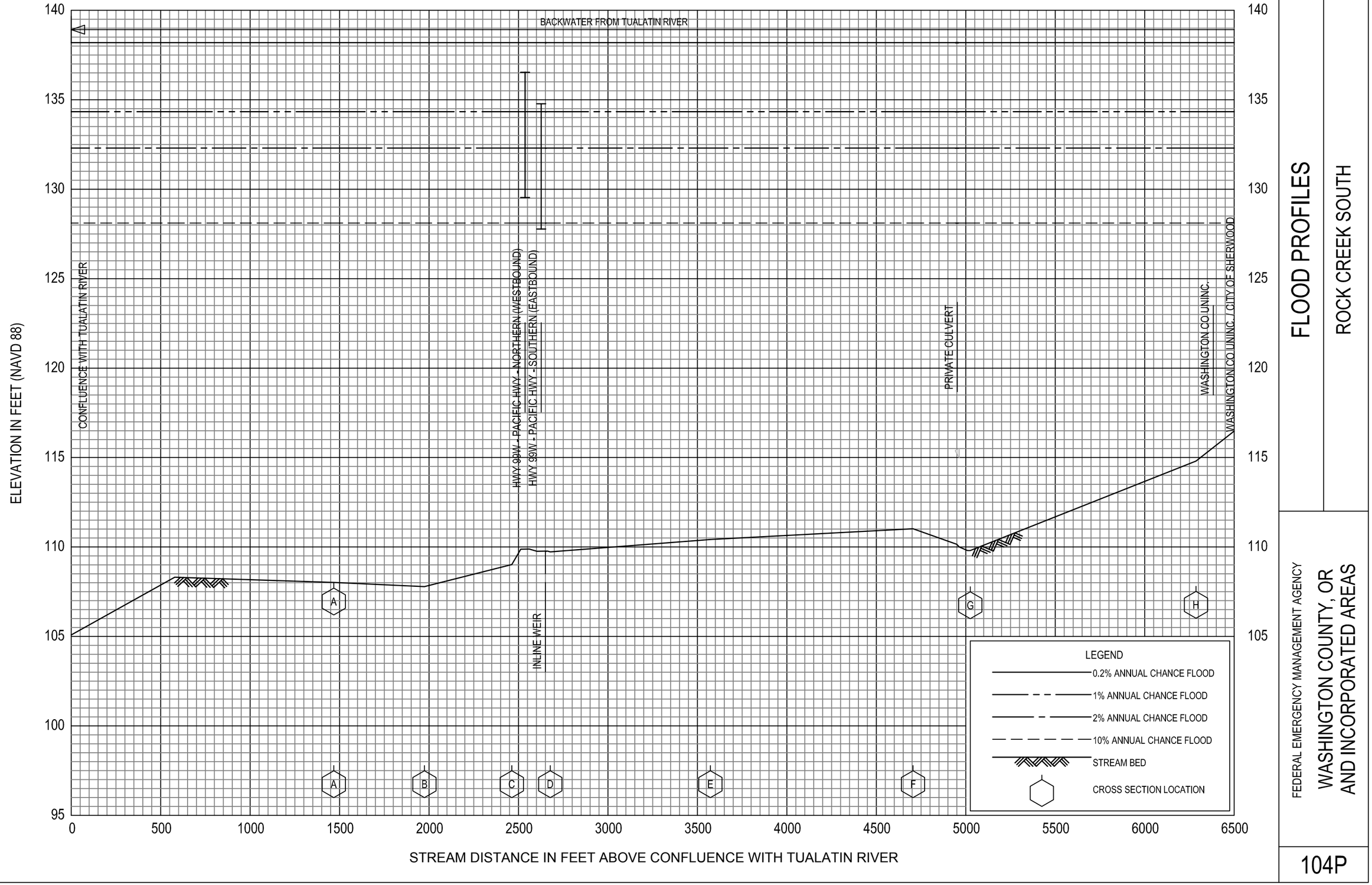
FLOOD PROFILES

ROCK CREEK NORTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

103P



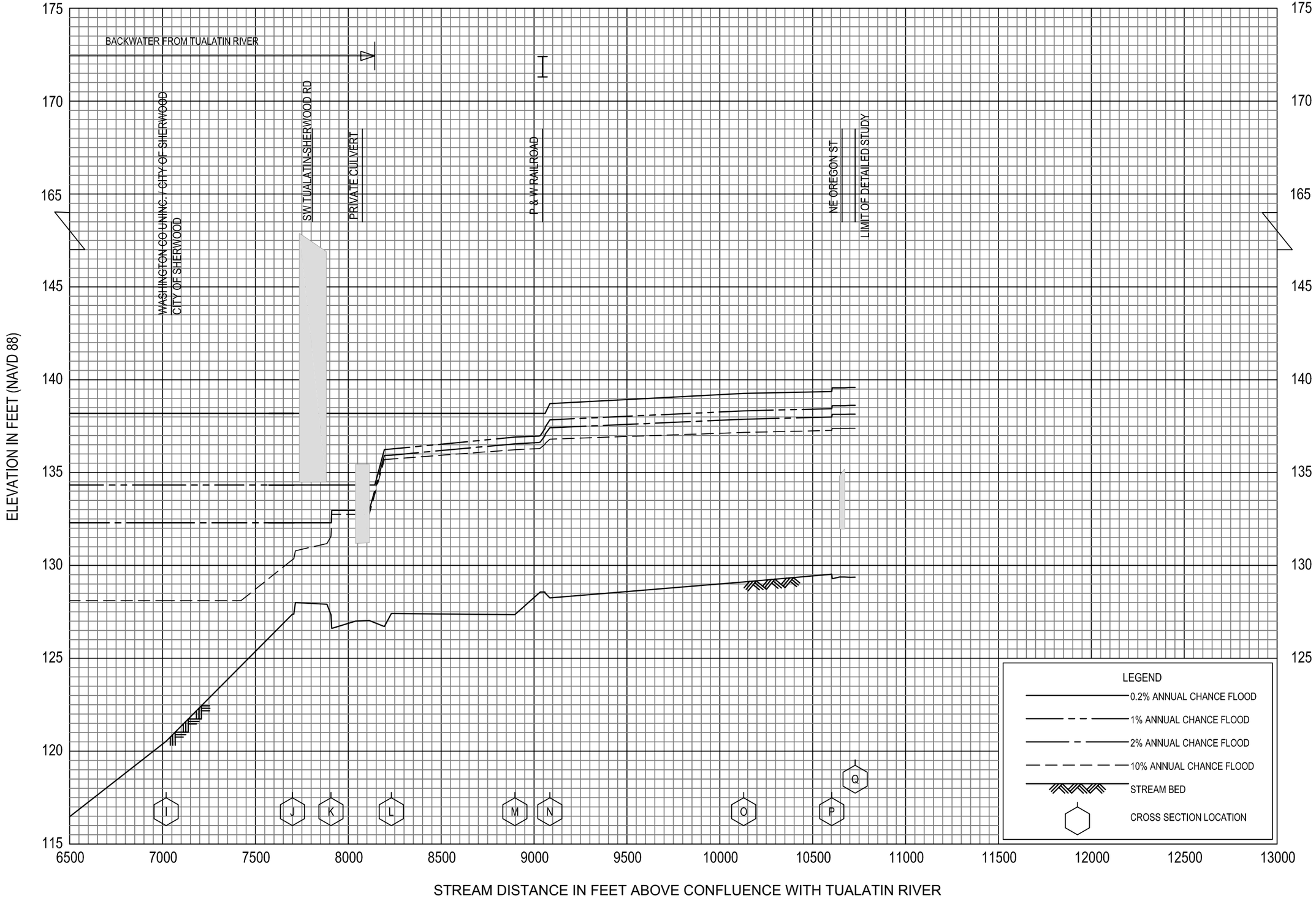
FLOOD PROFILES

ROCK CREEK SOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

104P



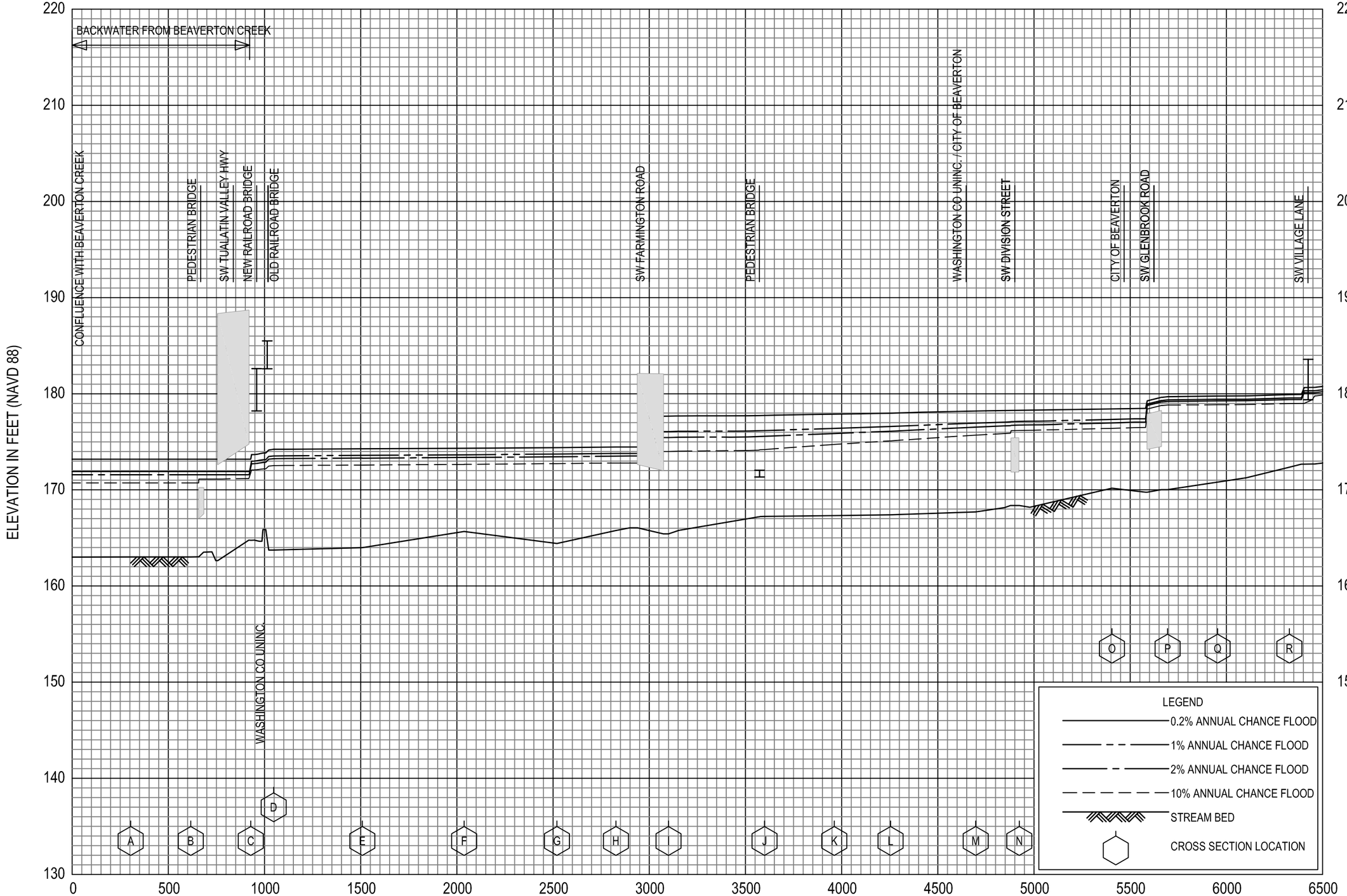
FLOOD PROFILES

ROCK CREEK SOUTH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

105P



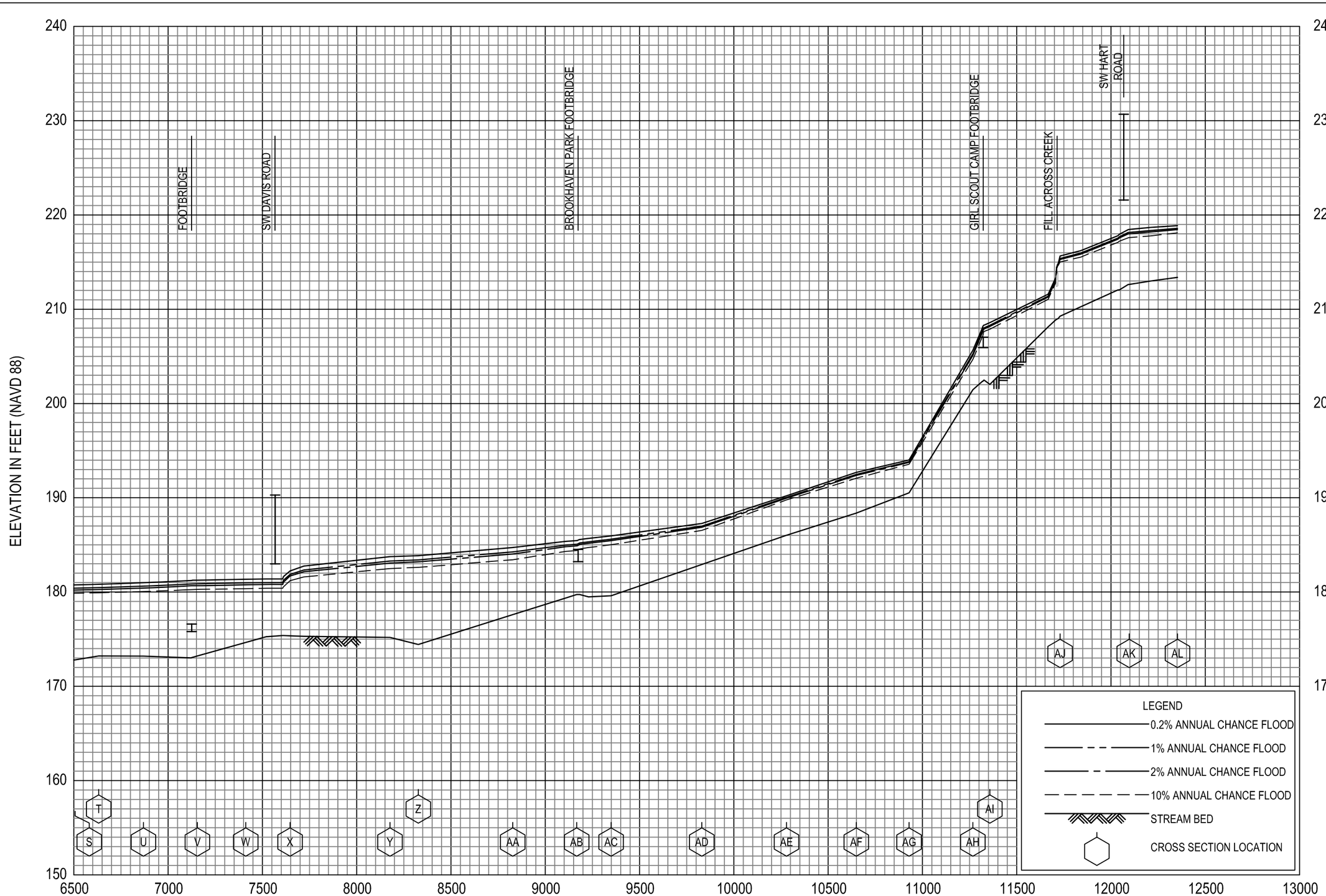
FLOOD PROFILES

SOUTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

106P



FLOOD PROFILES

SOUTH JOHNSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

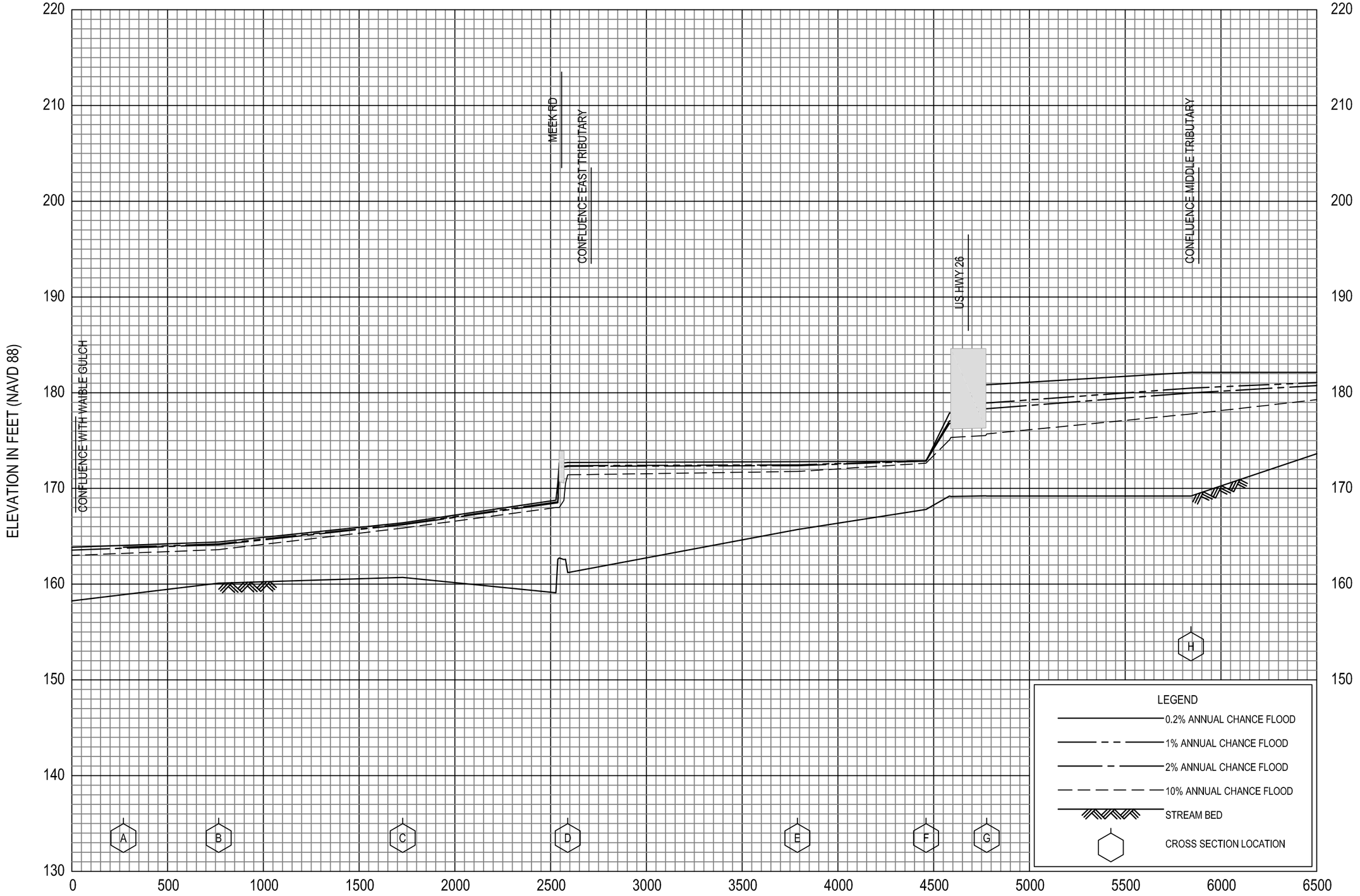
107P

FLOOD PROFILES

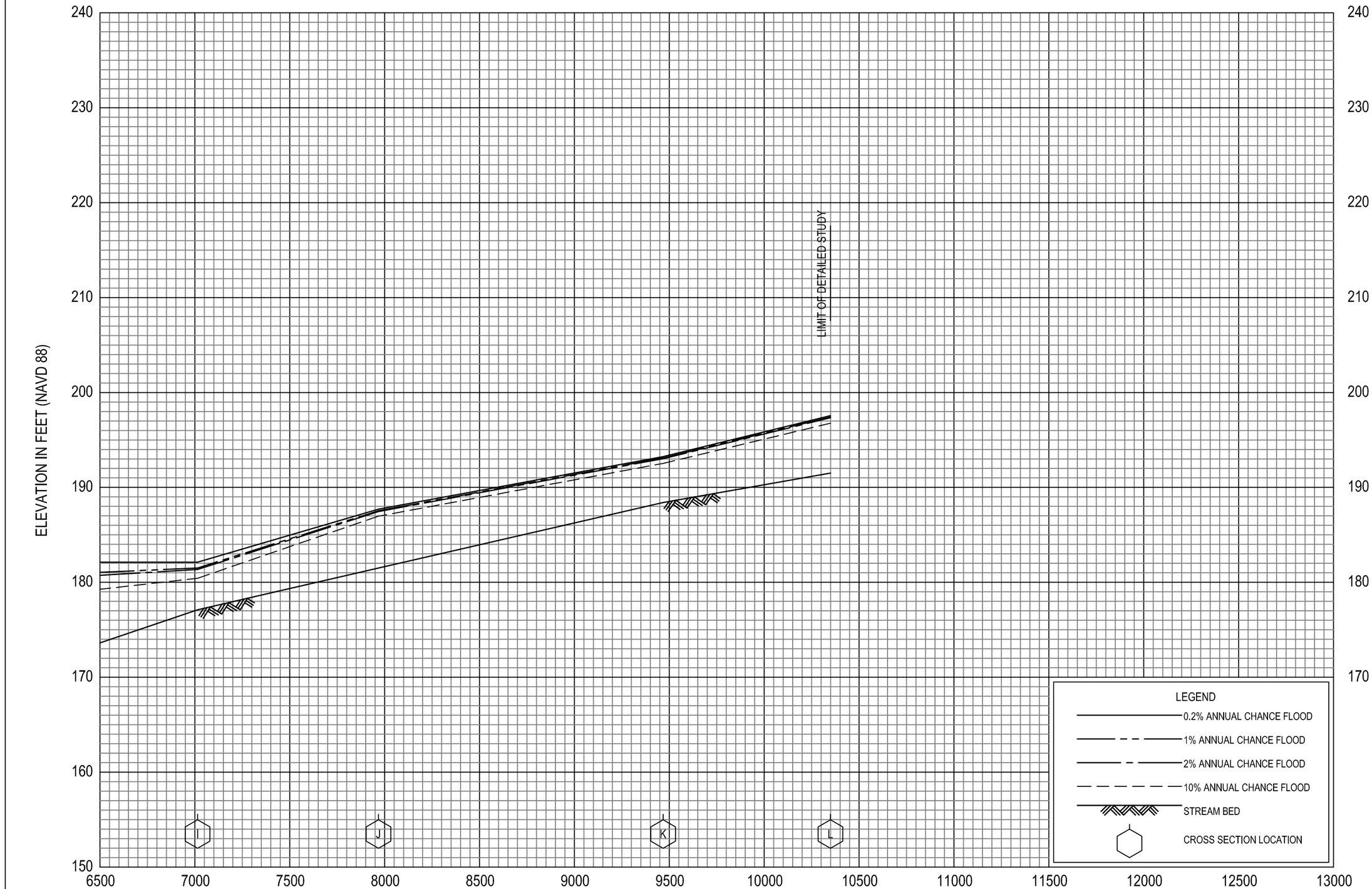
STOREY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



108P

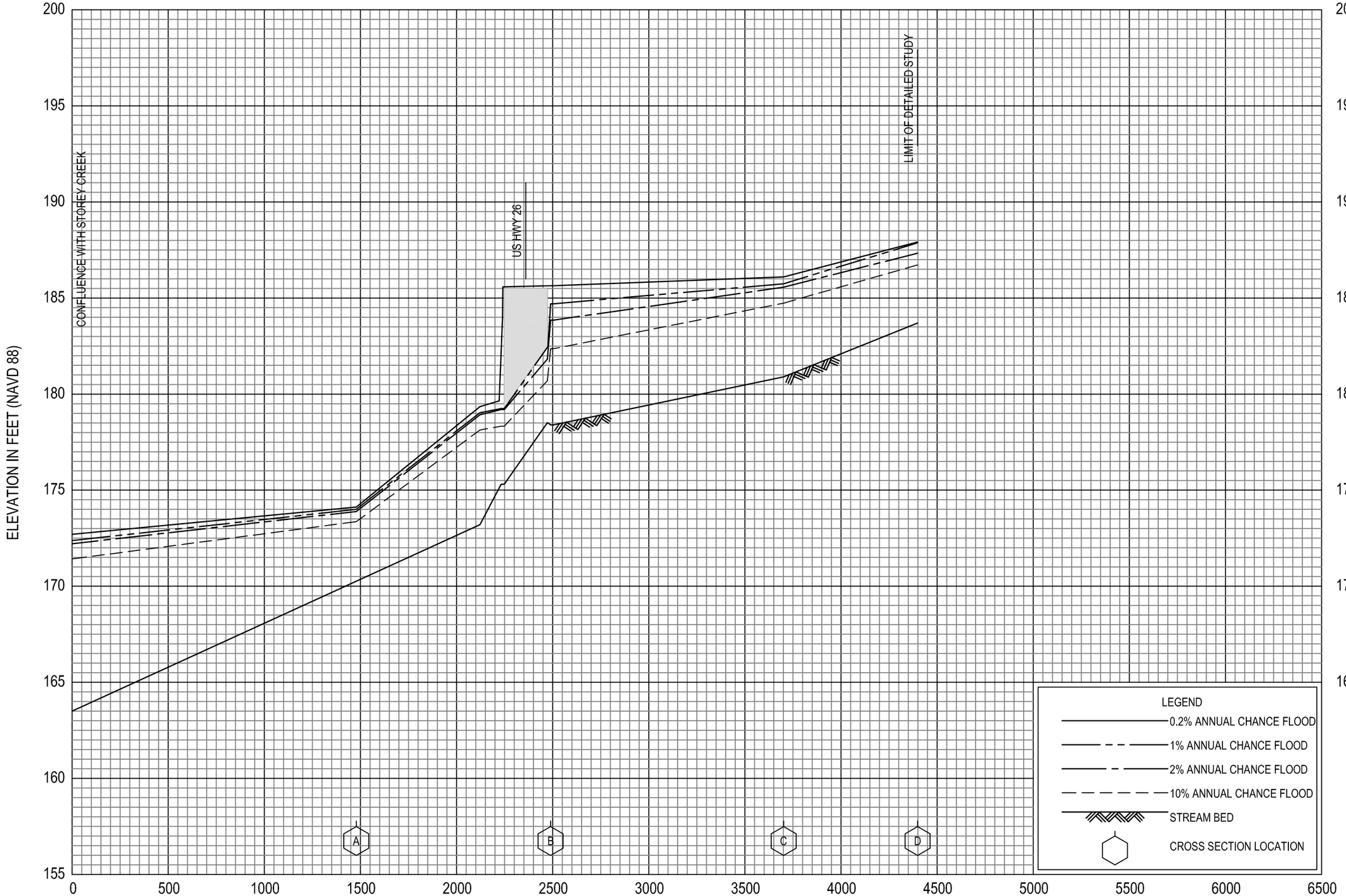


FLOOD PROFILES

STOREY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

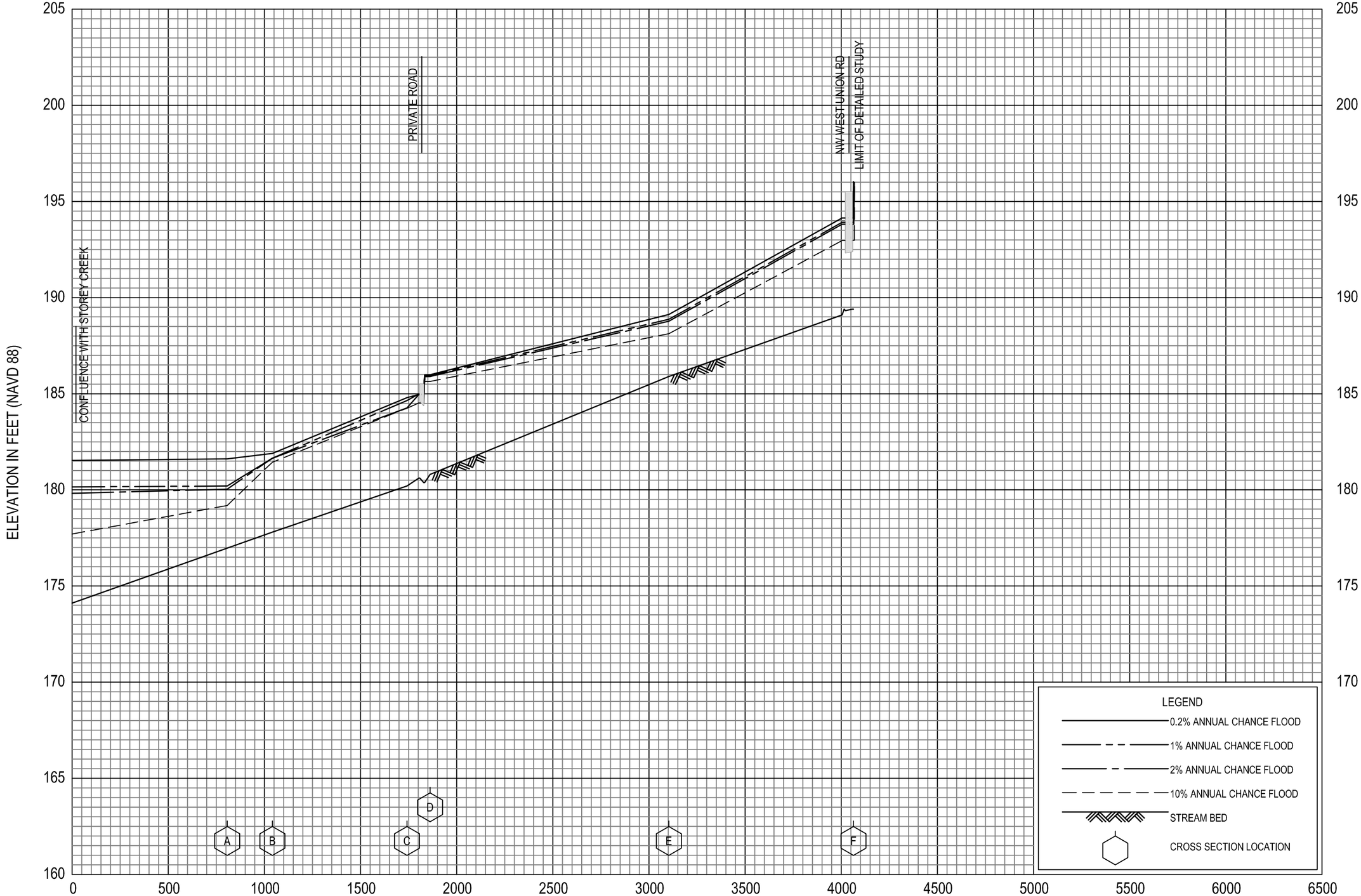


FLOOD PROFILES

STOREY CREEK - EAST TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS



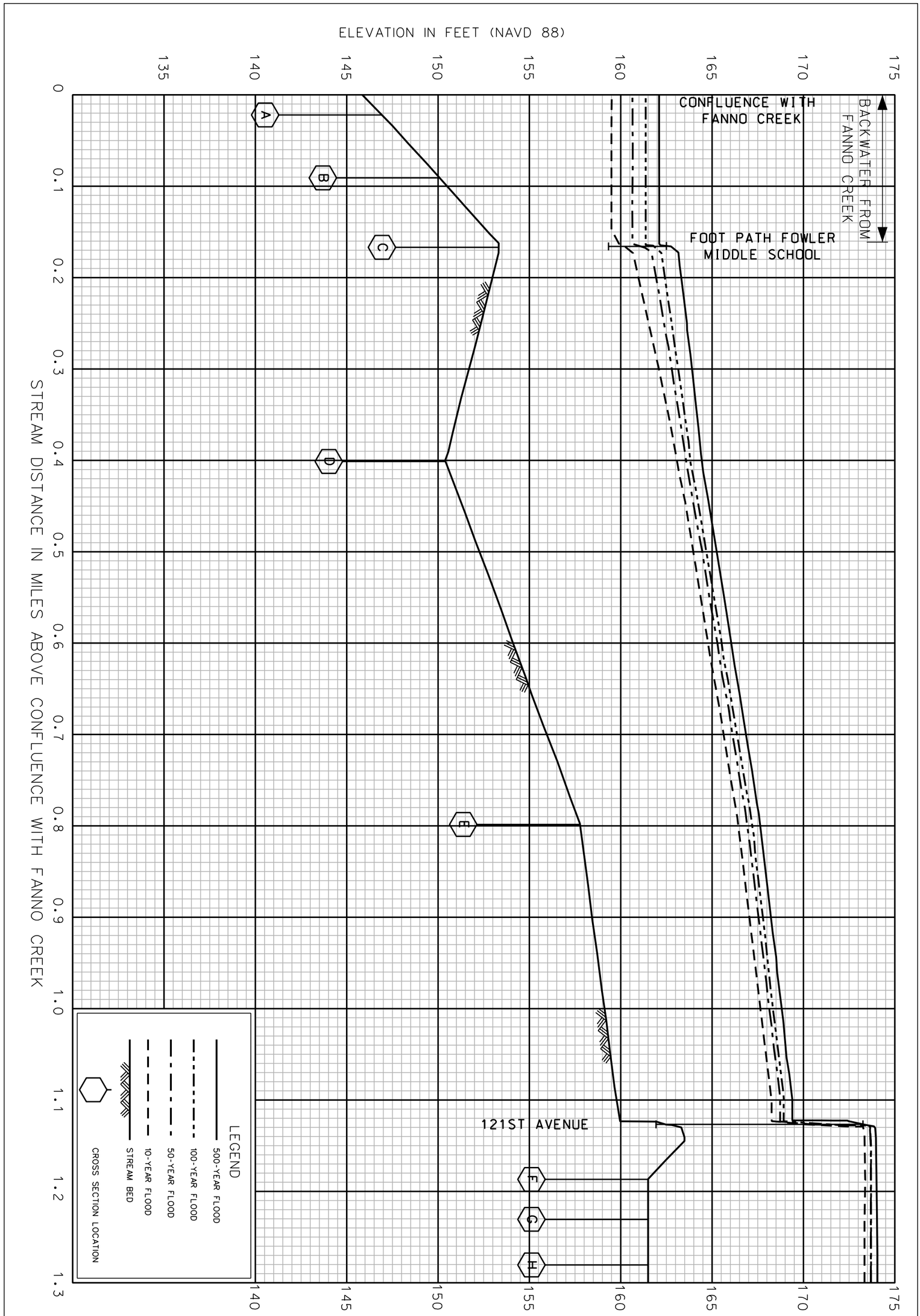
FLOOD PROFILES

STOREY CREEK - MIDDLE TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

111P

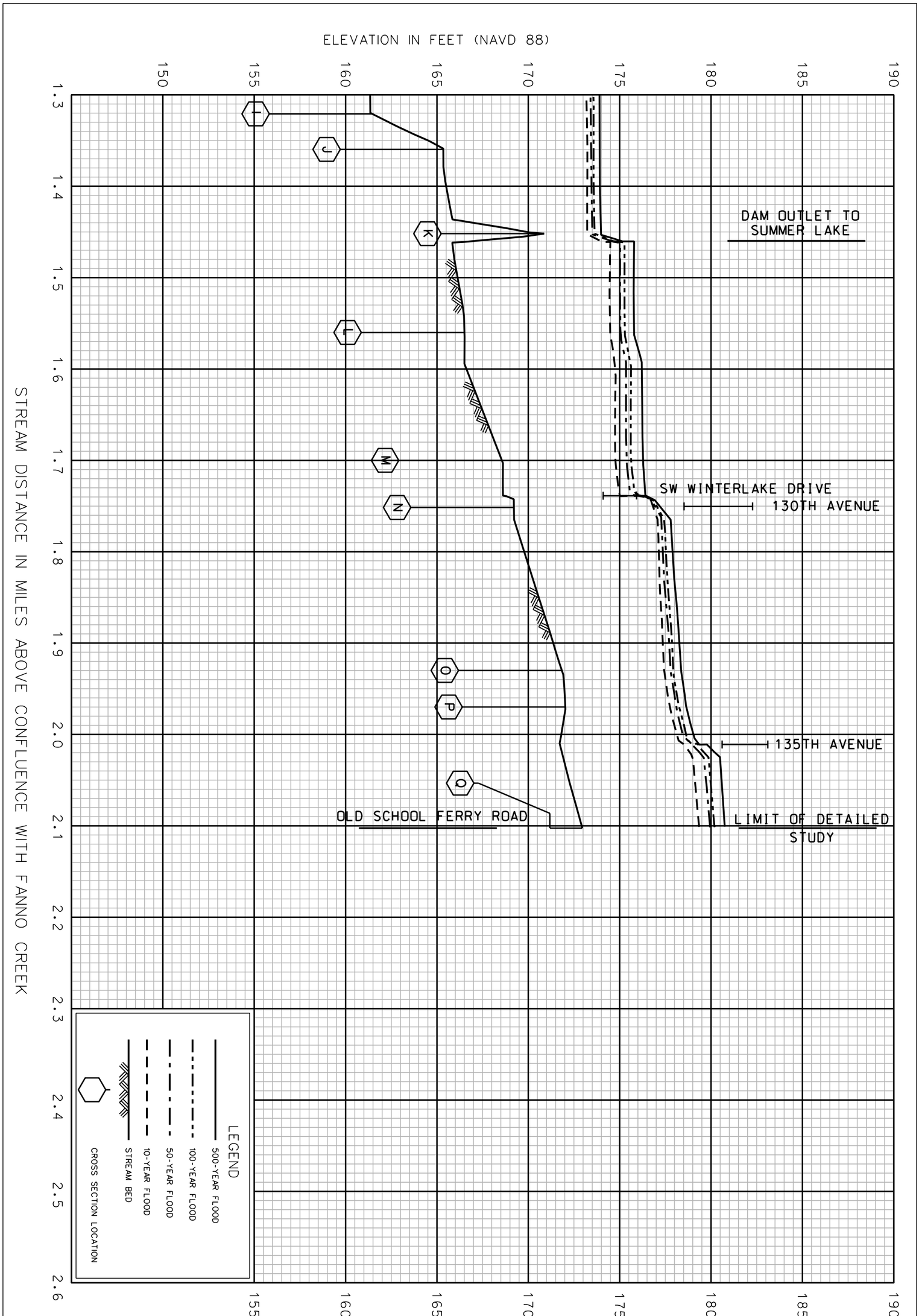


112P

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

SUMMER CREEK



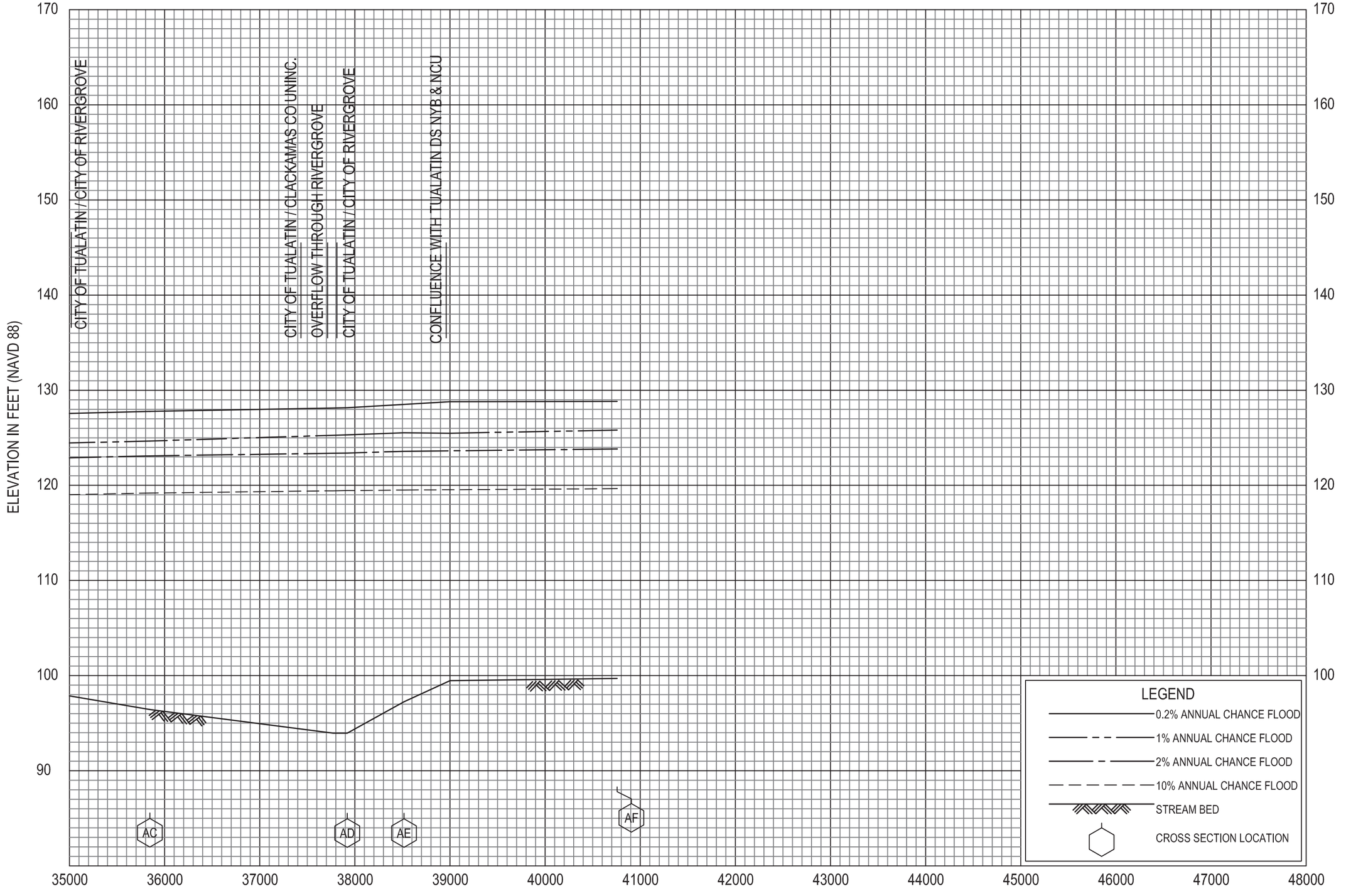
113P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

SUMMER CREEK



FLOOD PROFILES

TUALATIN RIVER (WITHIN CITY OF TUALATIN IN CLAKAMAS COUNTY)

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

115P

ELEVATION IN FEET (NAVD 88)

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLAMETTE RIVER

60 70 80 90 120 130 140 150 160

40700 41700 42700 43700 44700 45700 46700 47700 48700 49700 50700 51700 52700 53700

CLACKAMAS / WASHINGTON COUNTY

I-5 BRIDGE

BOONES FERRY BRIDGE

CITY OF DURHAM

CITY OF TUALATIN

TUALATIN RIVER OVERFLOW TO NYBERG SLOUGH

CITY OF TUALATIN

CITY OF DURHAM

CONFLUENCE WITH FANNO CREEK

RAILROAD BRIDGE

TUALATIN / DURHAM / WASHINGTON CO UNINC. / TIGARD

CITY OF TUALATIN

CITY OF TUALATIN

TIGARD / WASHINGTON CO UNINC. / TUALATIN

WASHINGTON CO UNINC.

CITY OF TUALATIN

CITY OF TUALATIN

CITY OF DURHAM

CONFLUENCE WITH HEDGES CREEK

EAST/WEST RAILROAD BRIDGE

CITY OF DURHAM

TUALATIN / DURHAM / WASHINGTON CO UNINC. / TIGARD

A B C D E F G H I J K L M N

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

TUALATIN RIVER

ELEVATION IN FEET (NAVD 88)

150
140
130
120
100
90
80
70
60

CONFLUENCE WITH UNNAMED N TRIB

CITY OF TIGARD / WASHINGTON CO
CITY OF TIGARD / WASHINGTON CO UNINC.

CITY OF TIGARD/WASHINGTON CO UNINC.
WASHINGTON CO UNINC.

HWY 99/SW PACIFIC HWY (NORTHBOUND)
HWY 99/SW PACIFIC HWY (SOUTHBOUND)

CITY OF TUALATIN / CITY OF KING CITY
WASHINGTON CO UNINC.

WASHINGTON CO UNINC.
WASHINGTON CO UNINC. / TUALATIN

WASHINGTON CO UNINC. / TUALATIN
WASHINGTON CO UNINC. / KING CITY

WASHINGTON CO UNINC.
CITY OF TUALATIN / CITY OF KING CITY

O P Q R S T

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

53700 54700 55700 56700 57700 58700 59700 60700 61700 62700 63700 64700 65700 66700

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLAMETTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

ELEVATION IN FEET (NAVD 88)

150
140
130
120
110
100
90
80
70
60

CITY OF KING CITY
WASHINGTON CO UNINC.

66700 67700 68700 69700 70700 71700 72700 73700 74700 75700 76700 77700 78700 79700

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLAMETTE RIVER

U V W X

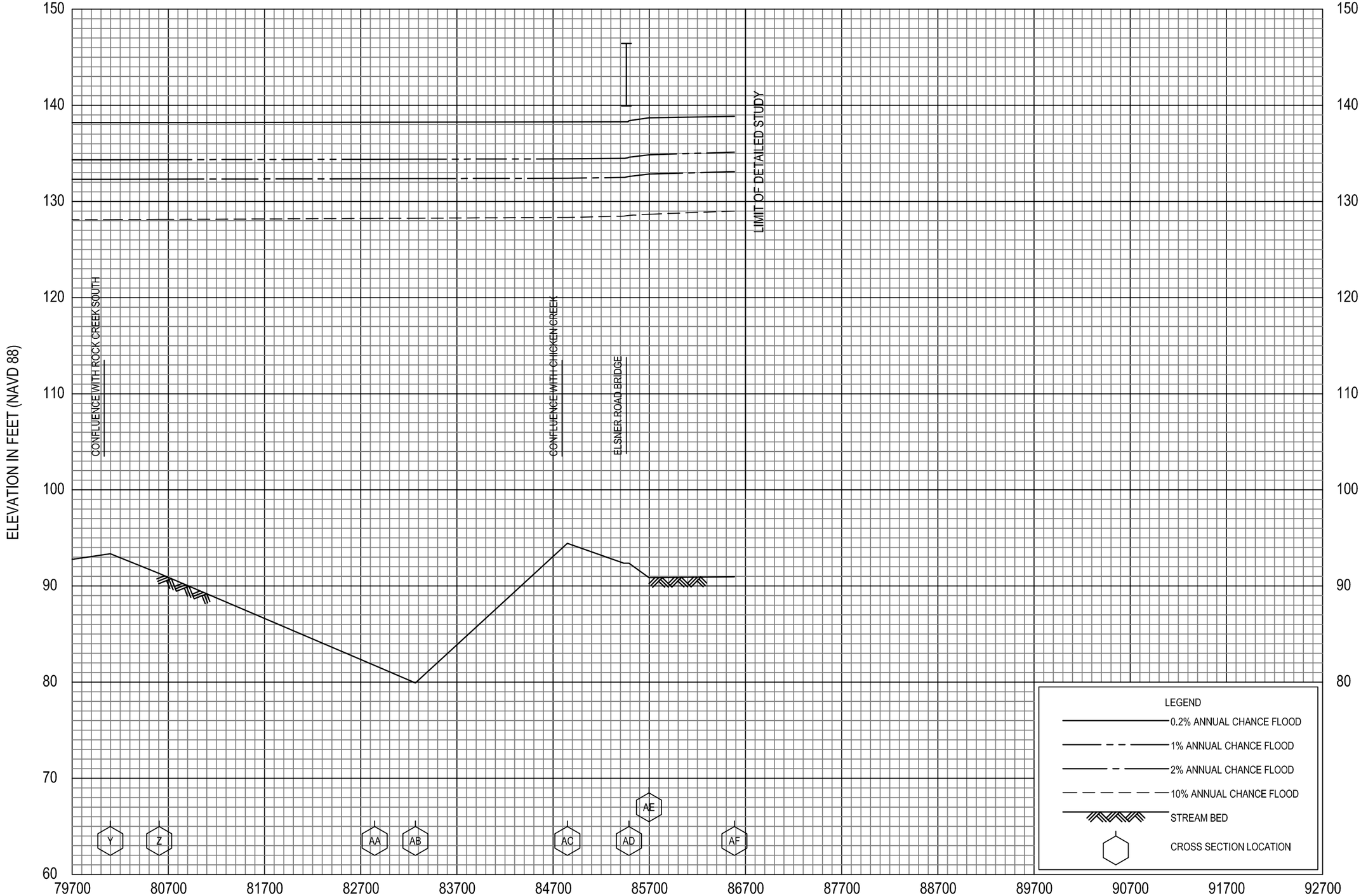
LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

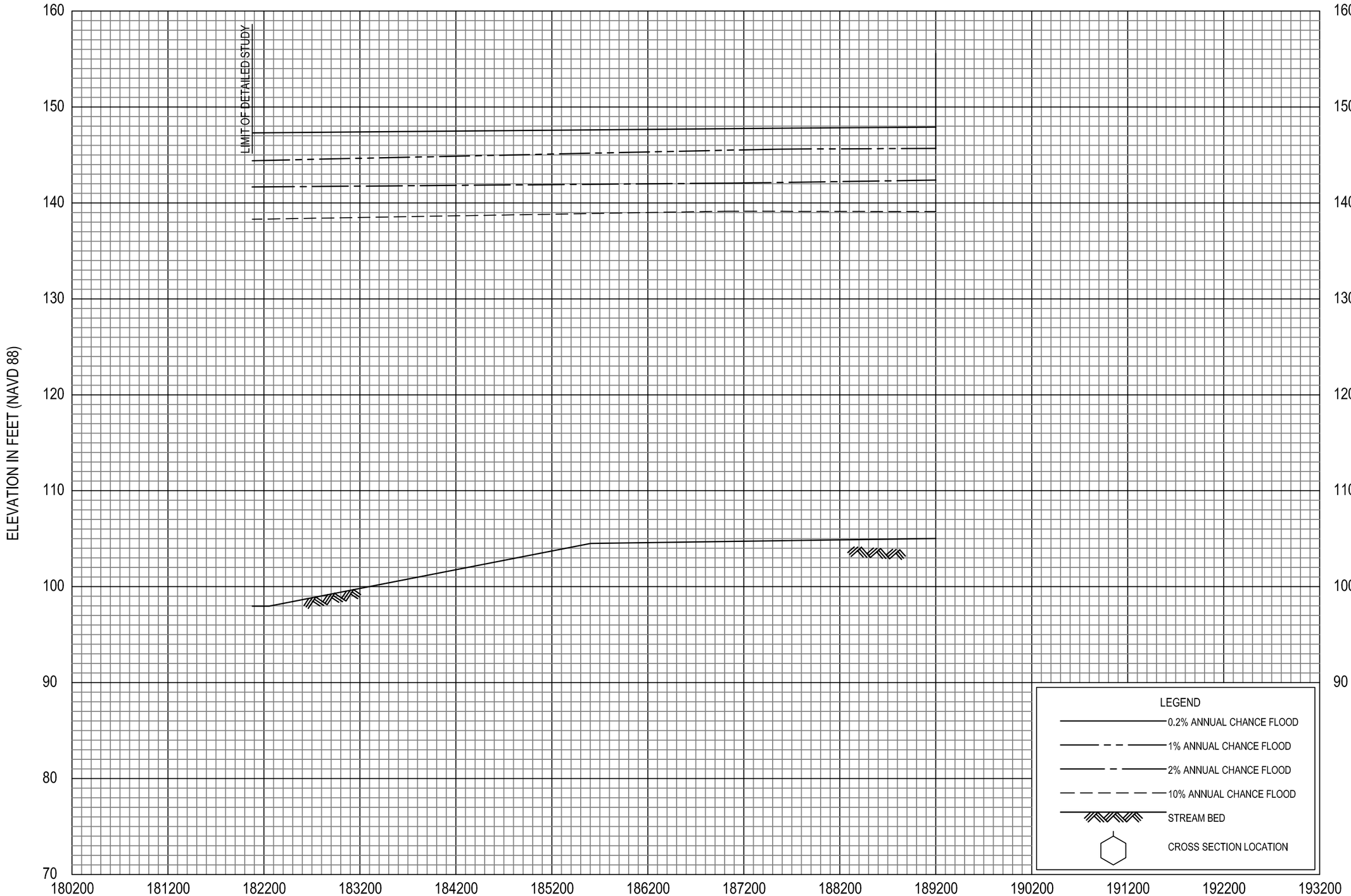


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

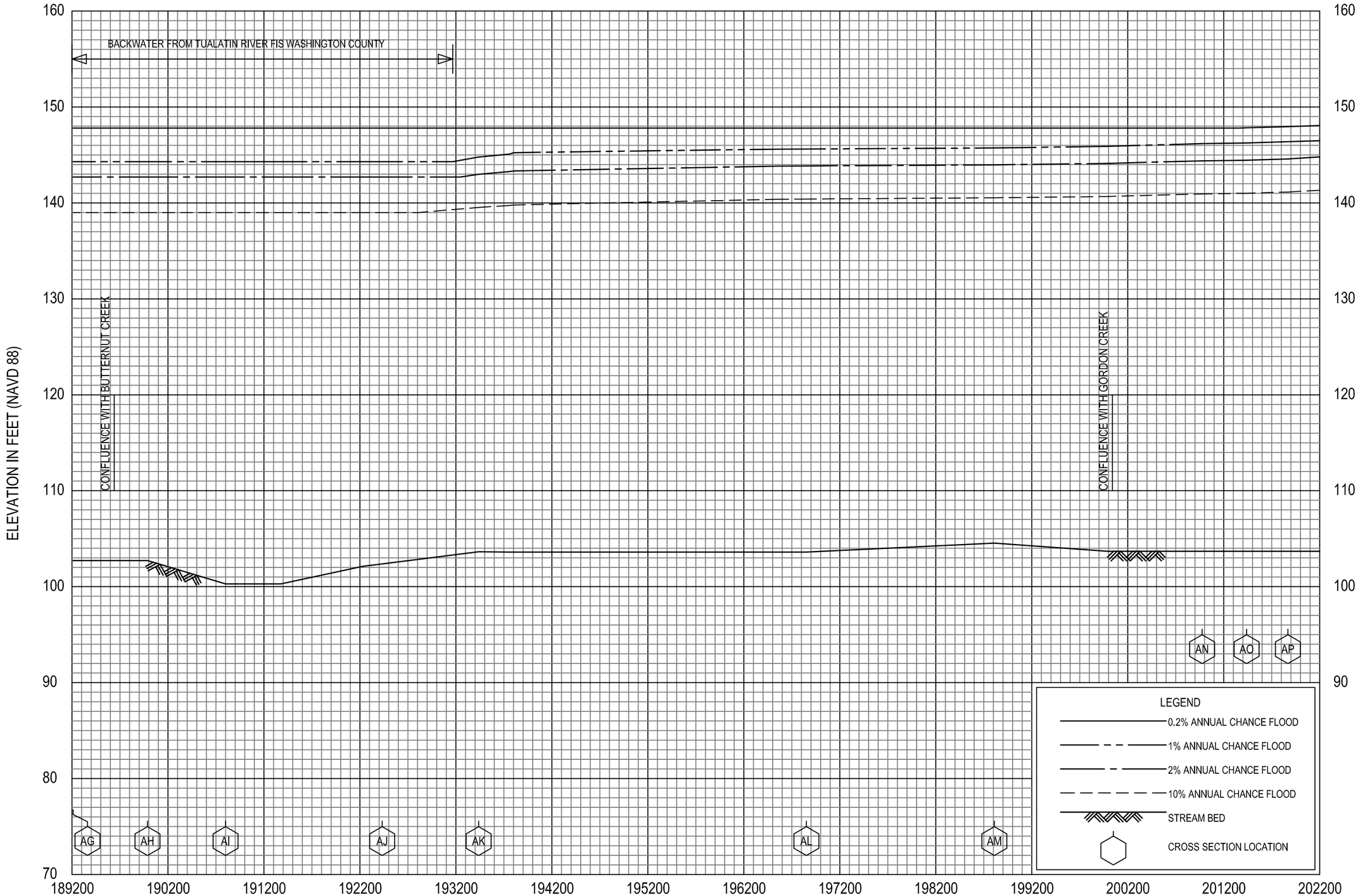


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

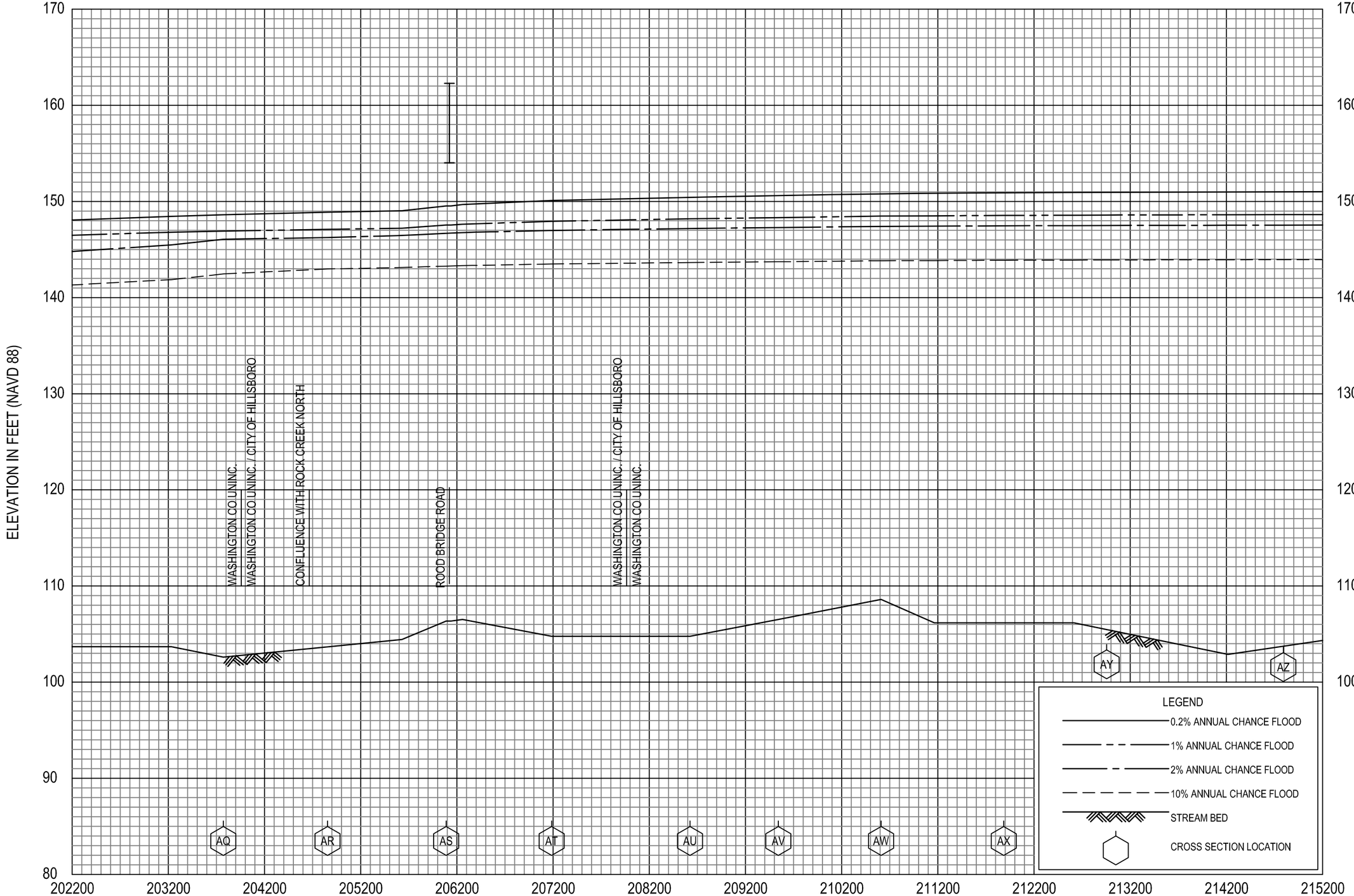


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

121P

FLOOD PROFILES

TUALATIN RIVER

ELEVATION IN FEET (NAVD 88)

170
160
150
140
130
120
110
100
90
80

CONFLUENCE WITH DAVIS CREEK

SW MINTER BRIDGE ROAD

BA BB BC BD BE BF BG BH BI

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

215200 216200 217200 218200 219200 220200 221200 222200 223200 224200 225200 226200 227200 228200

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLAMETTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

122P

FLOOD PROFILES

TUALATIN RIVER

ELEVATION IN FEET (NAVD 88)

170
160
150
140
130
120
110
100
90
80

228200
229200
230200
231200
232200
233200
234200
235200
236200
237200
238200
239200
240200
241200

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH WILLAMETTE RIVER

SW HILLSBORO HWY

WASHINGTON CO UNINC.

WASHINGTON CO UNINC. / CITY OF HILLSBORO

WASHINGTON CO UNINC. / CITY OF HILLSBORO

WASHINGTON CO UNINC.

CONFLUENCE WITH DAIRY CREEK

BJ
BK
BL
BM
BN
BO
BP

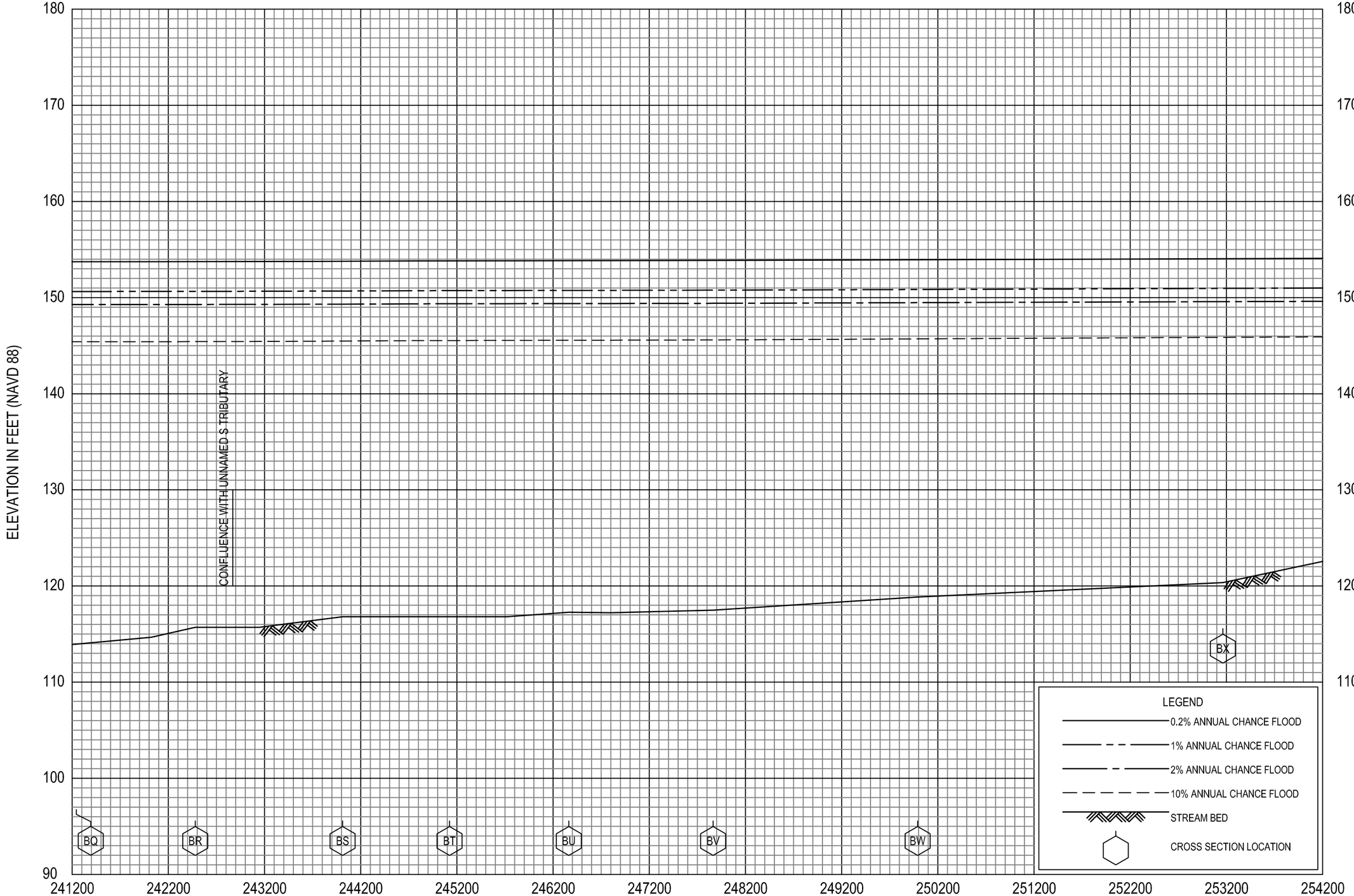
LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

123P

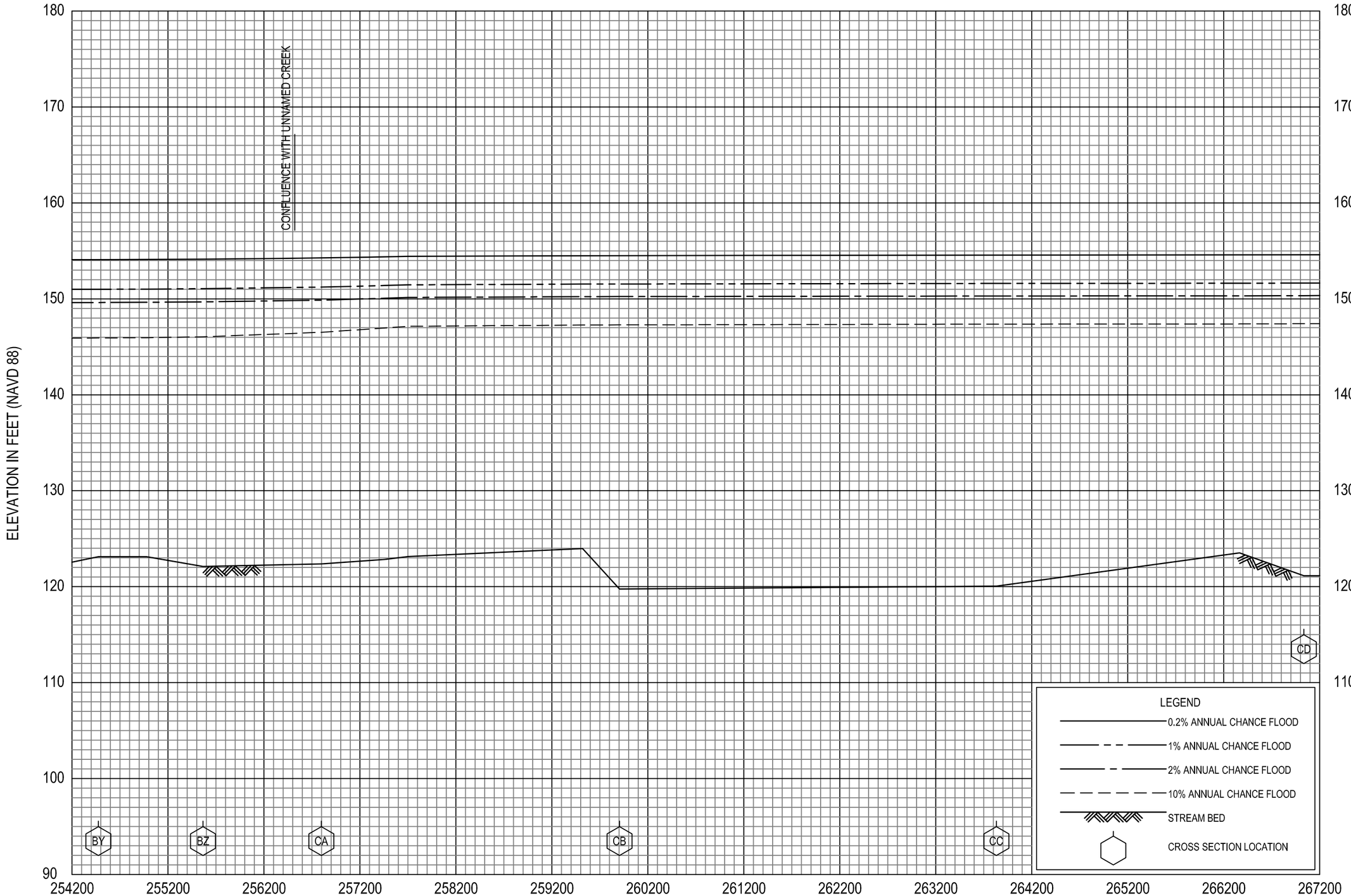


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

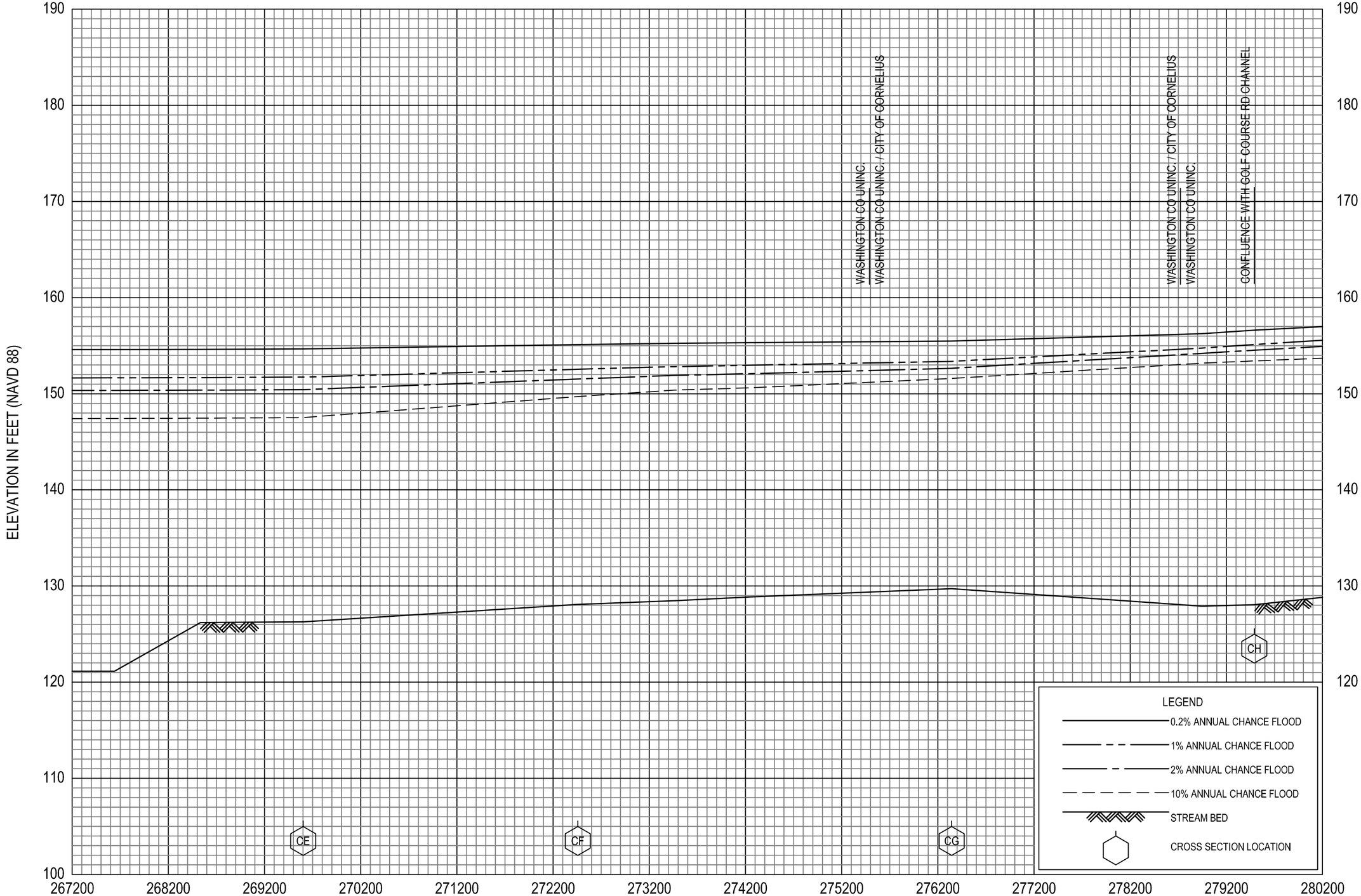


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



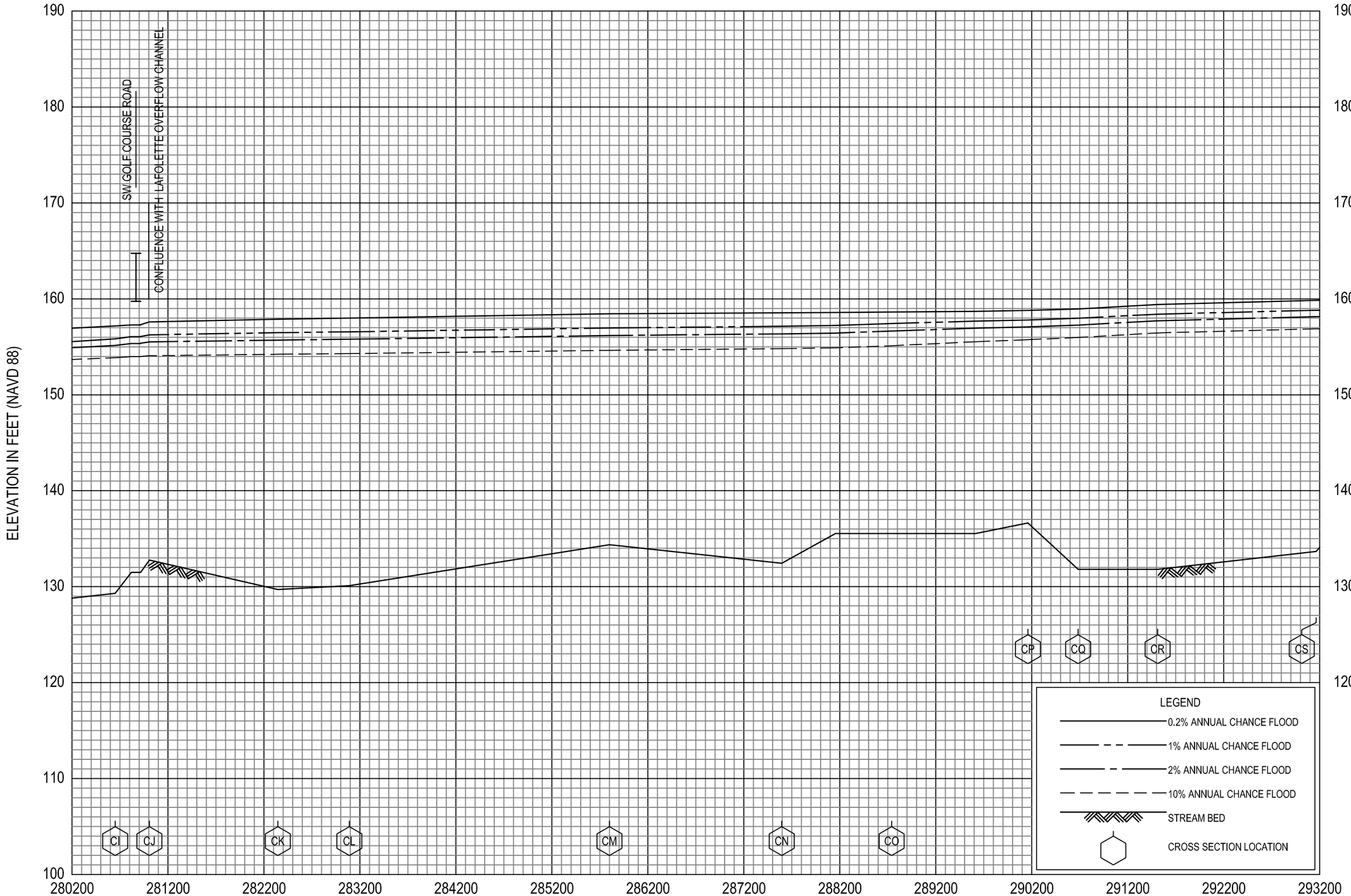
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

126P



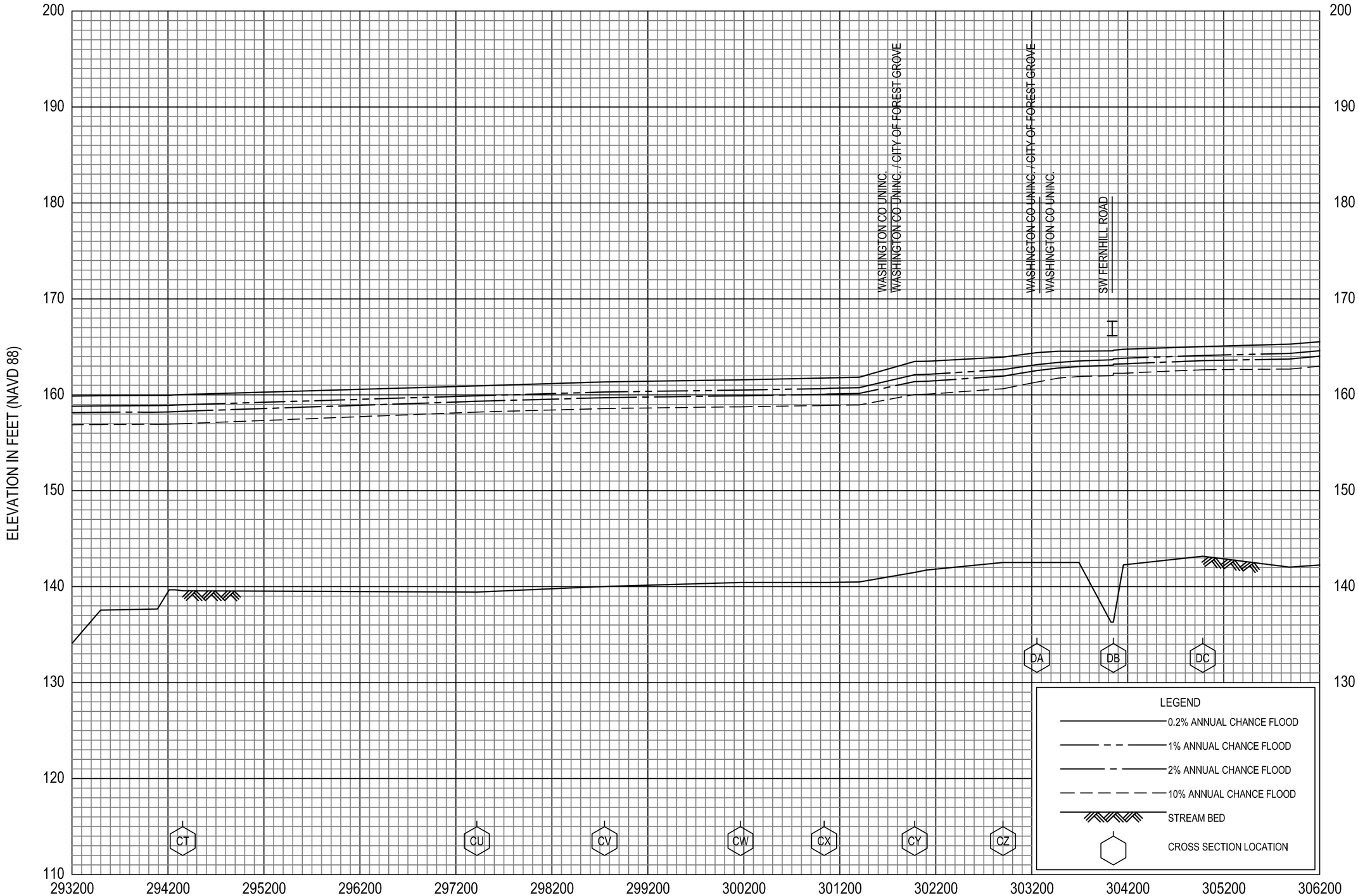
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

127P

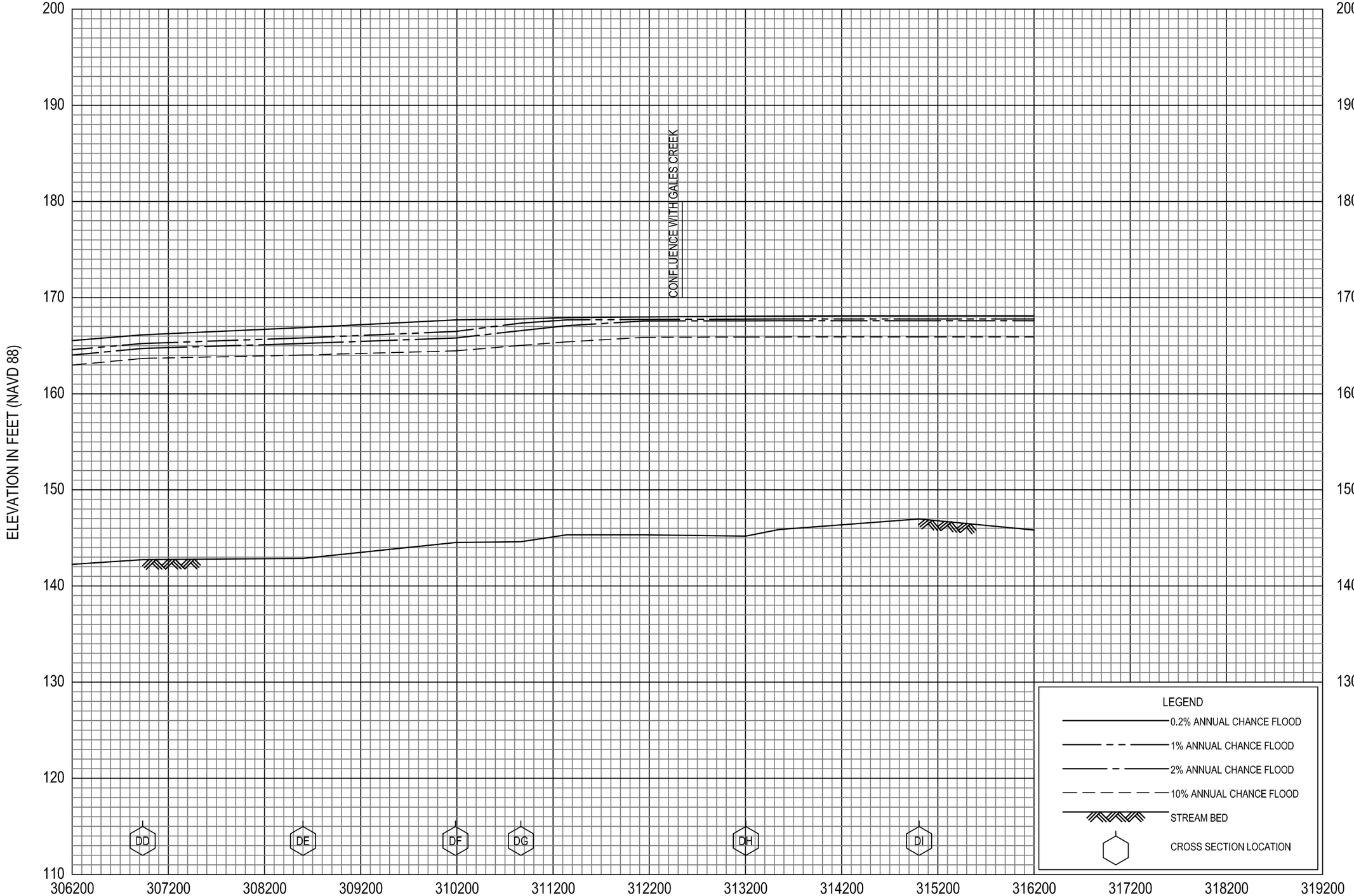


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

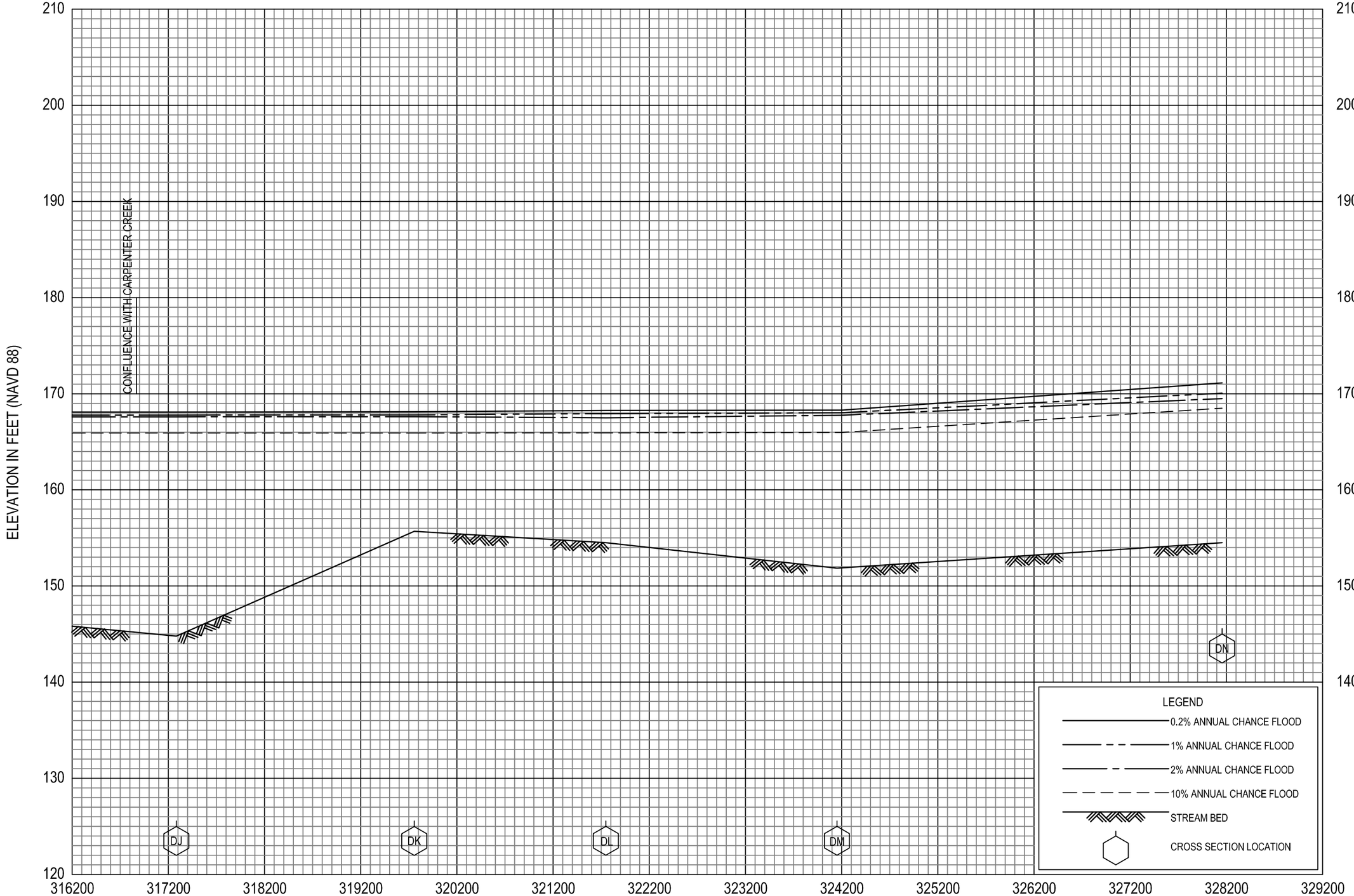


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

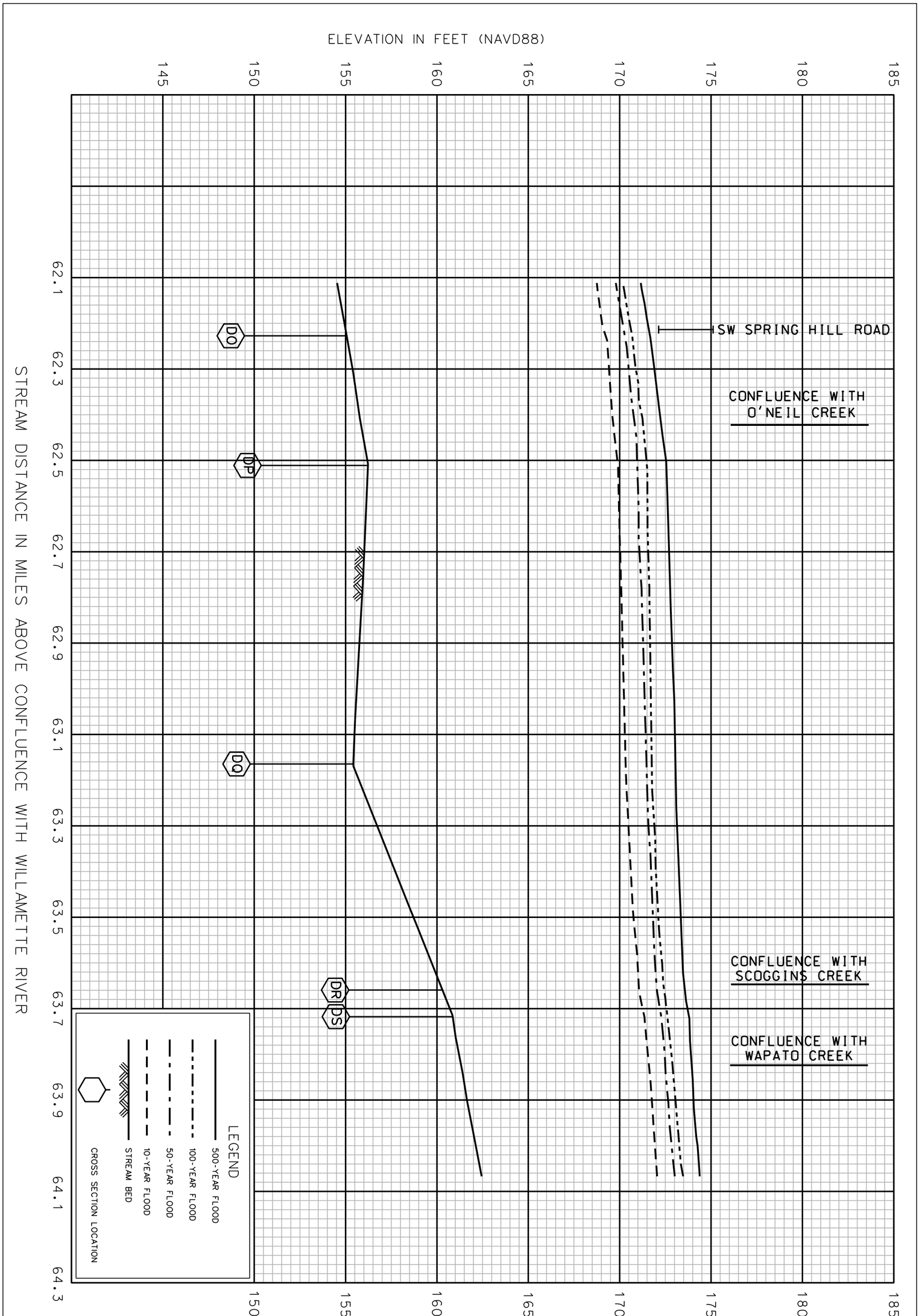


FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



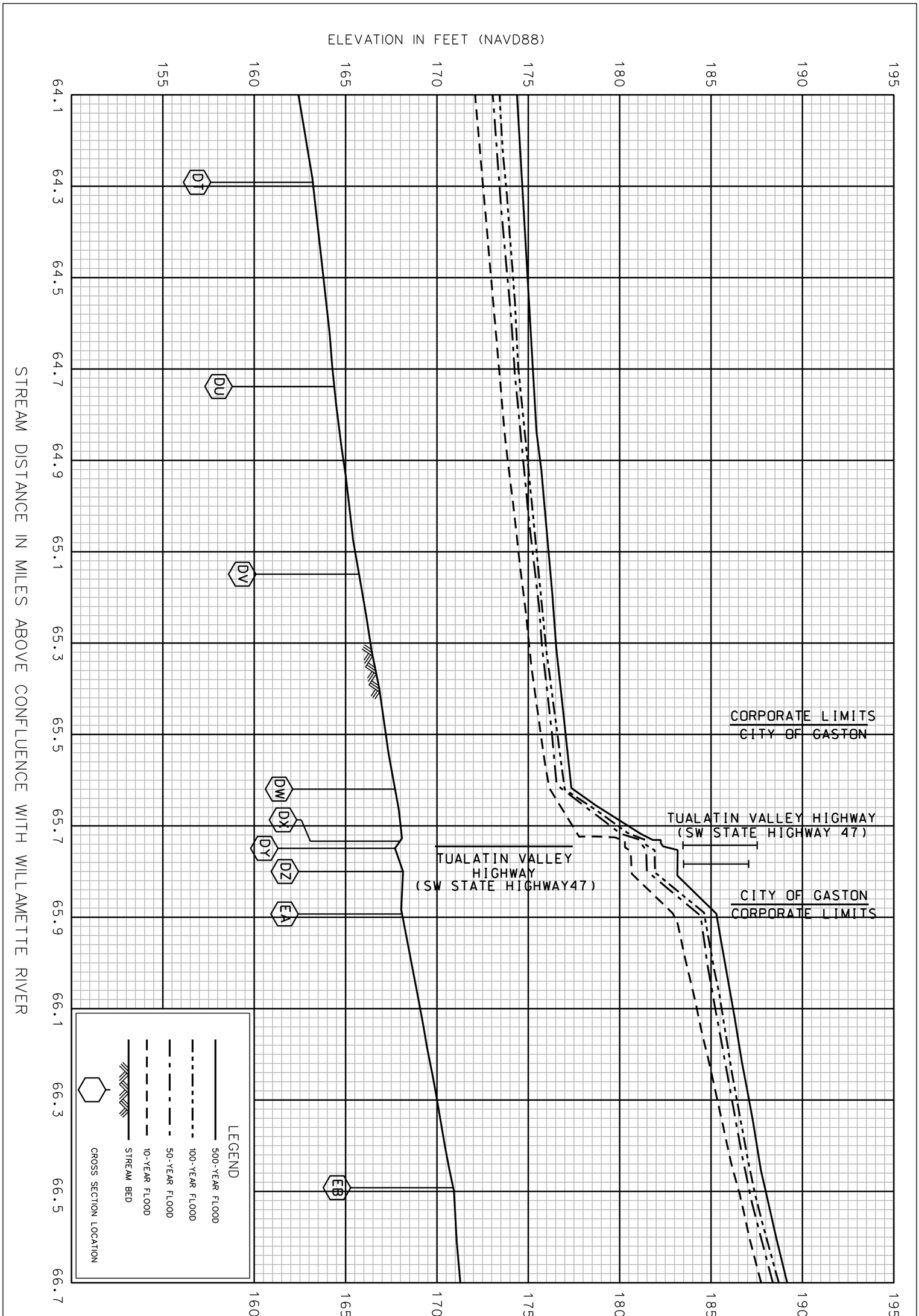
131P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

TUALATIN RIVER



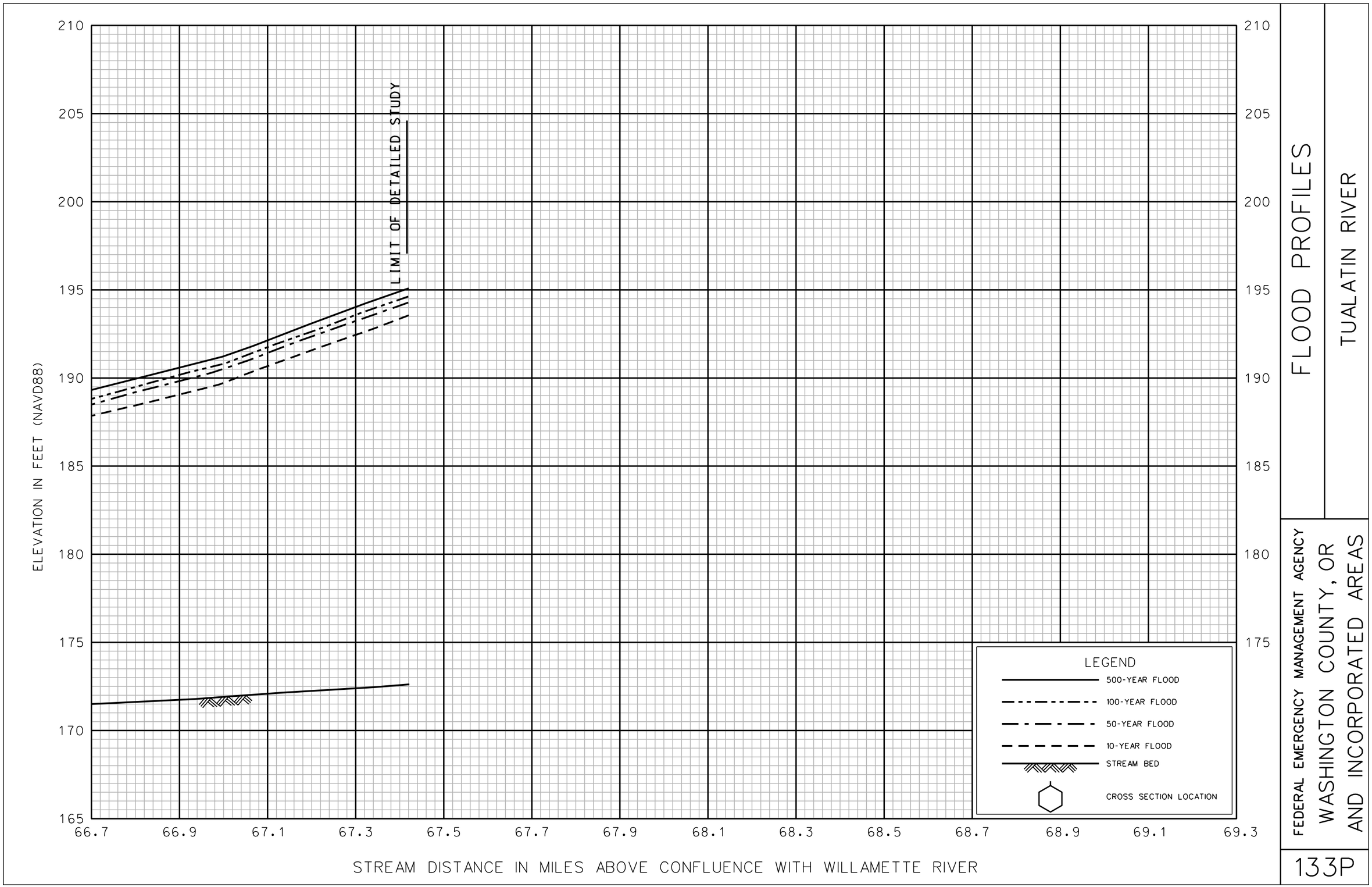
132P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

FLOOD PROFILES

TUALATIN RIVER



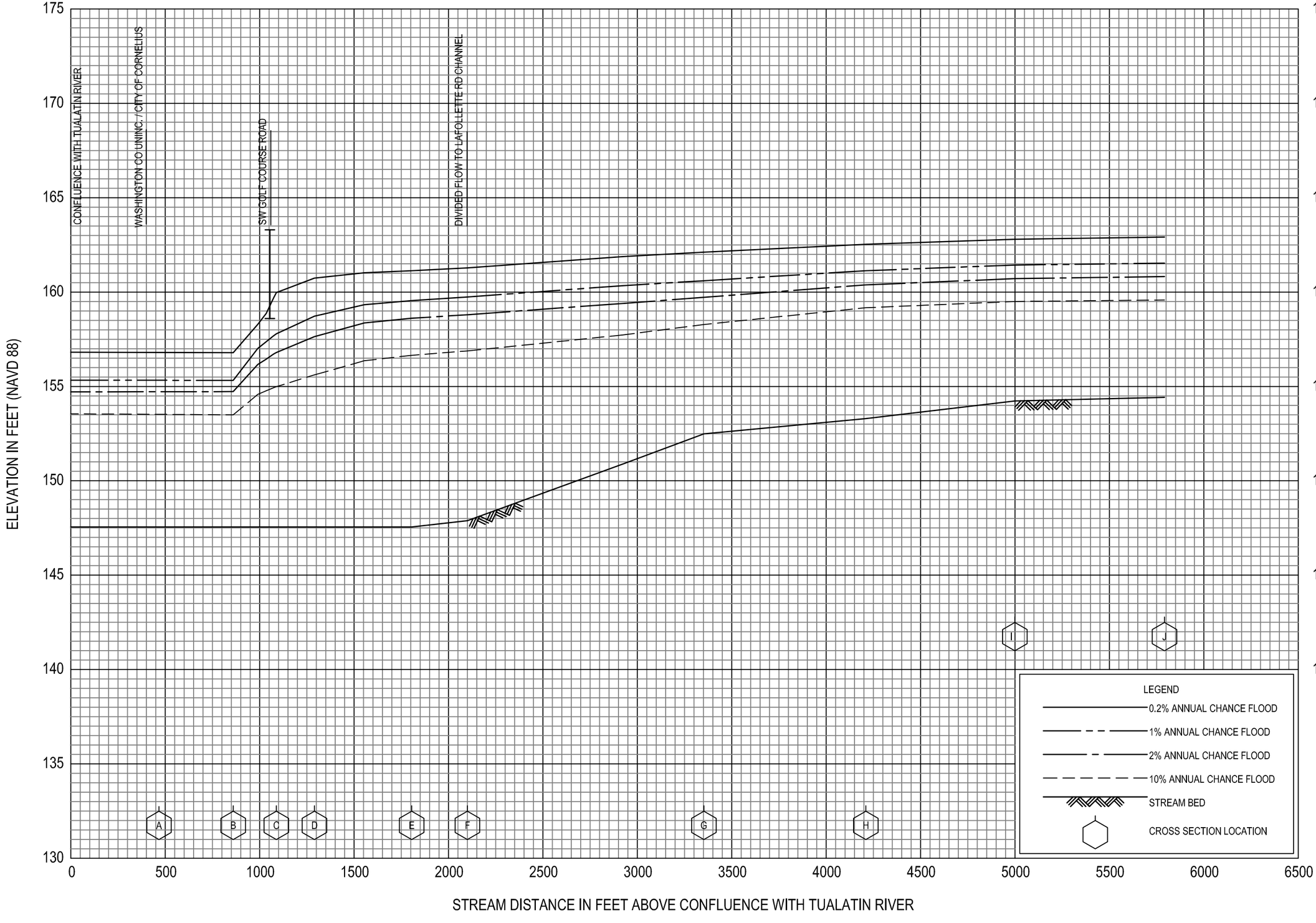
FLOOD PROFILES

TUALATIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

133P

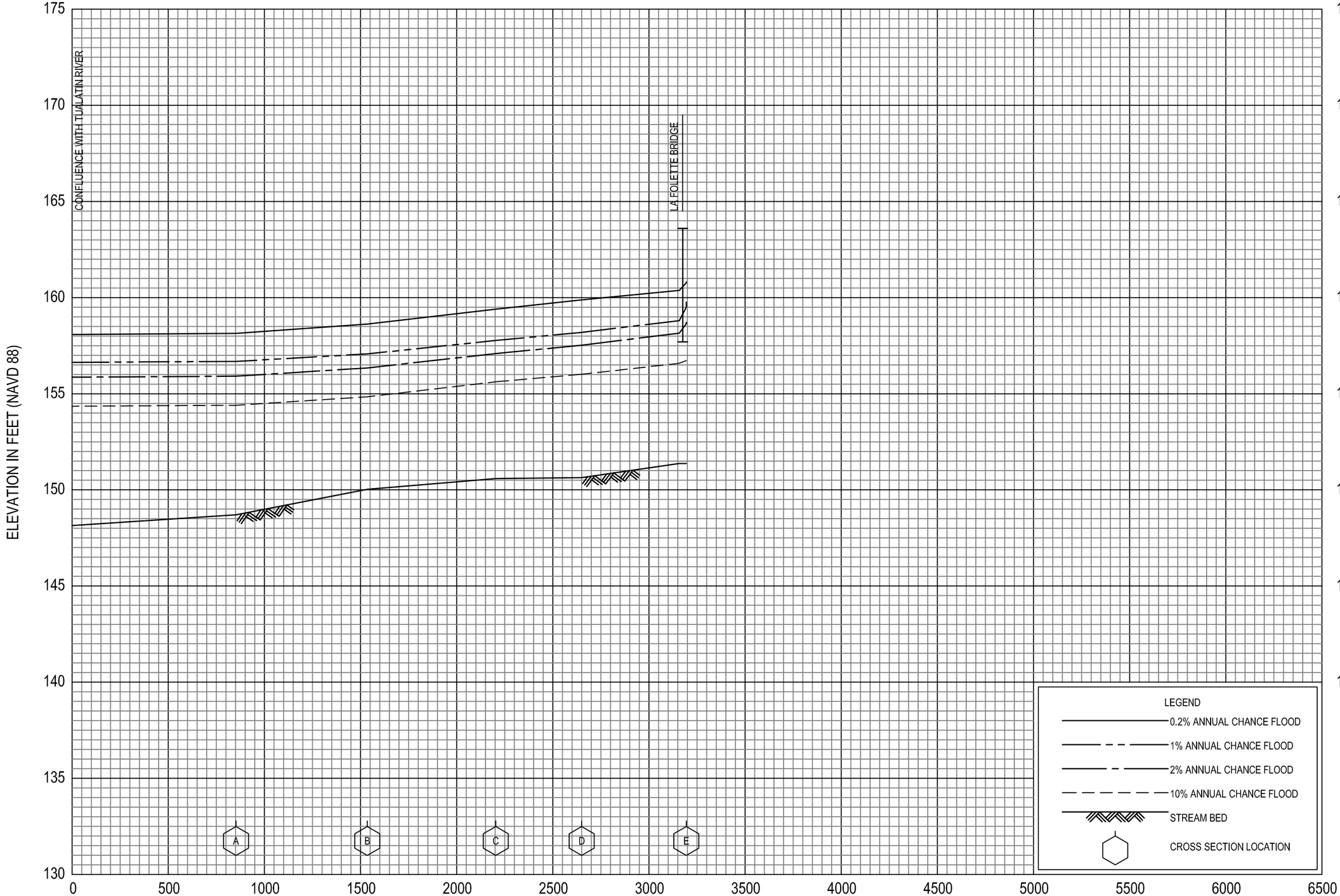


FLOOD PROFILES

TUALATIN RIVER - GOLF COURSE OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS



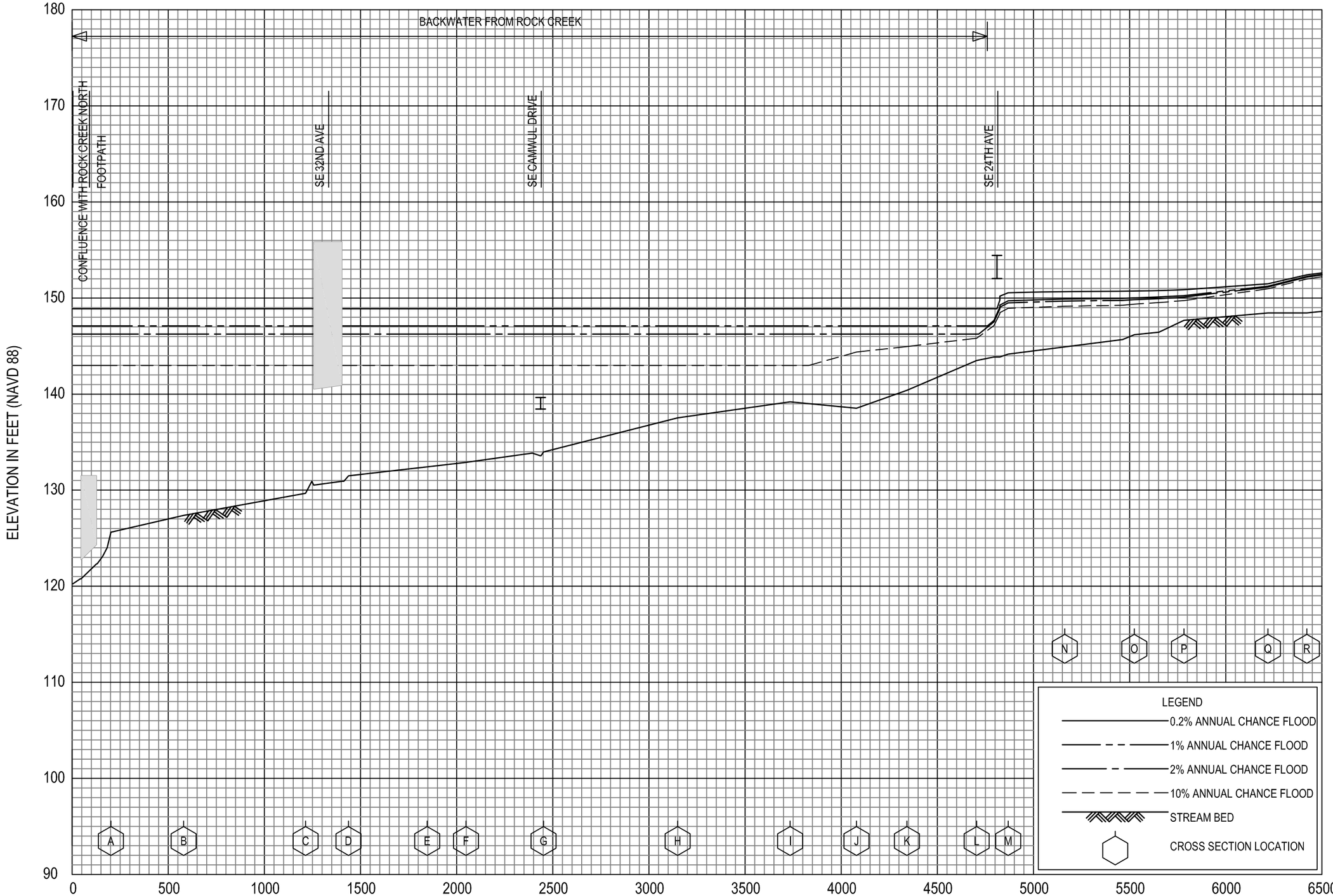
FLOOD PROFILES

TUALATIN RIVER - LA FOLETTE OVERFLOW

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY , OR
AND INCORPORATED AREAS

135P



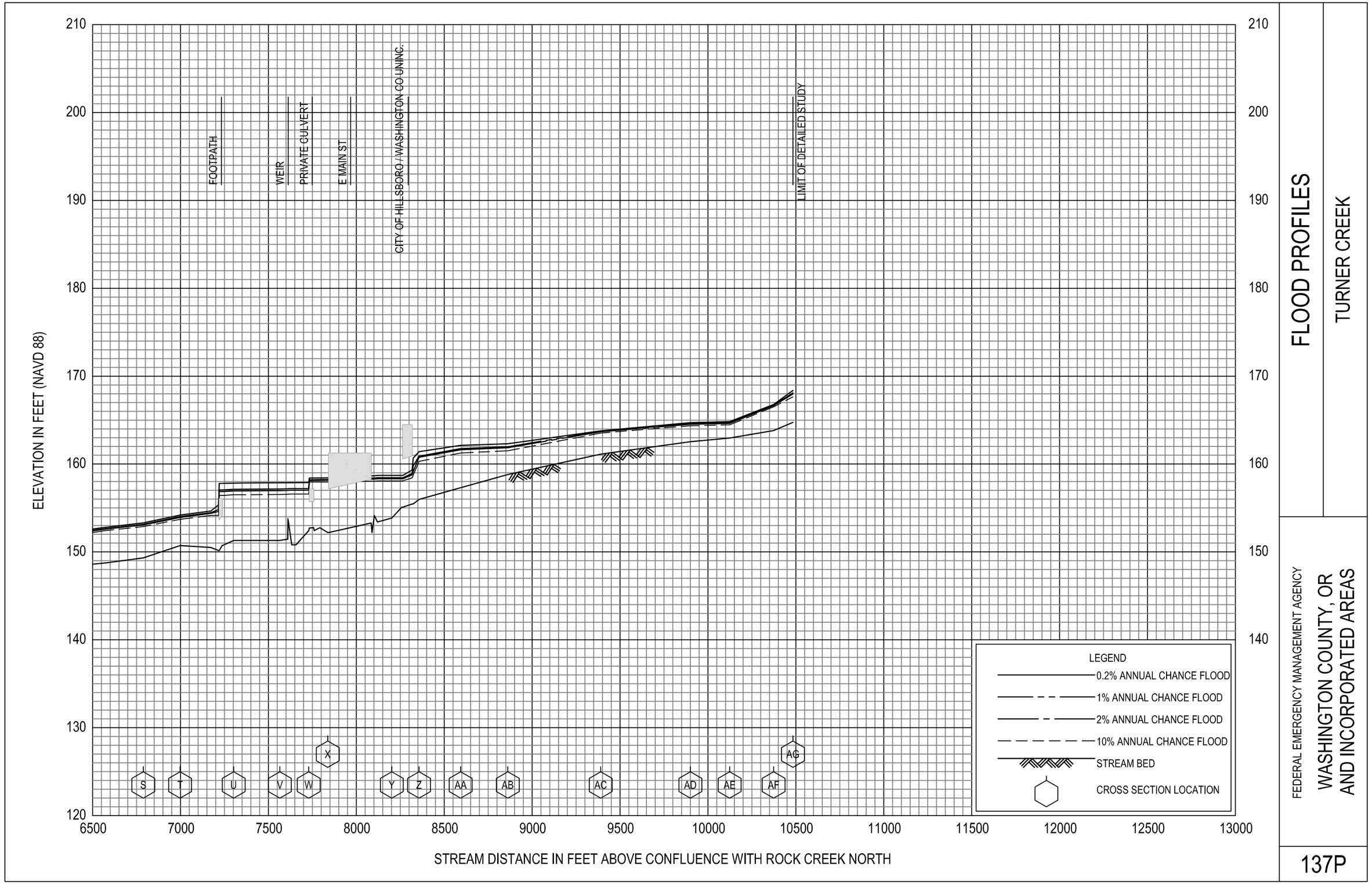
FLOOD PROFILES

TURNER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

136P



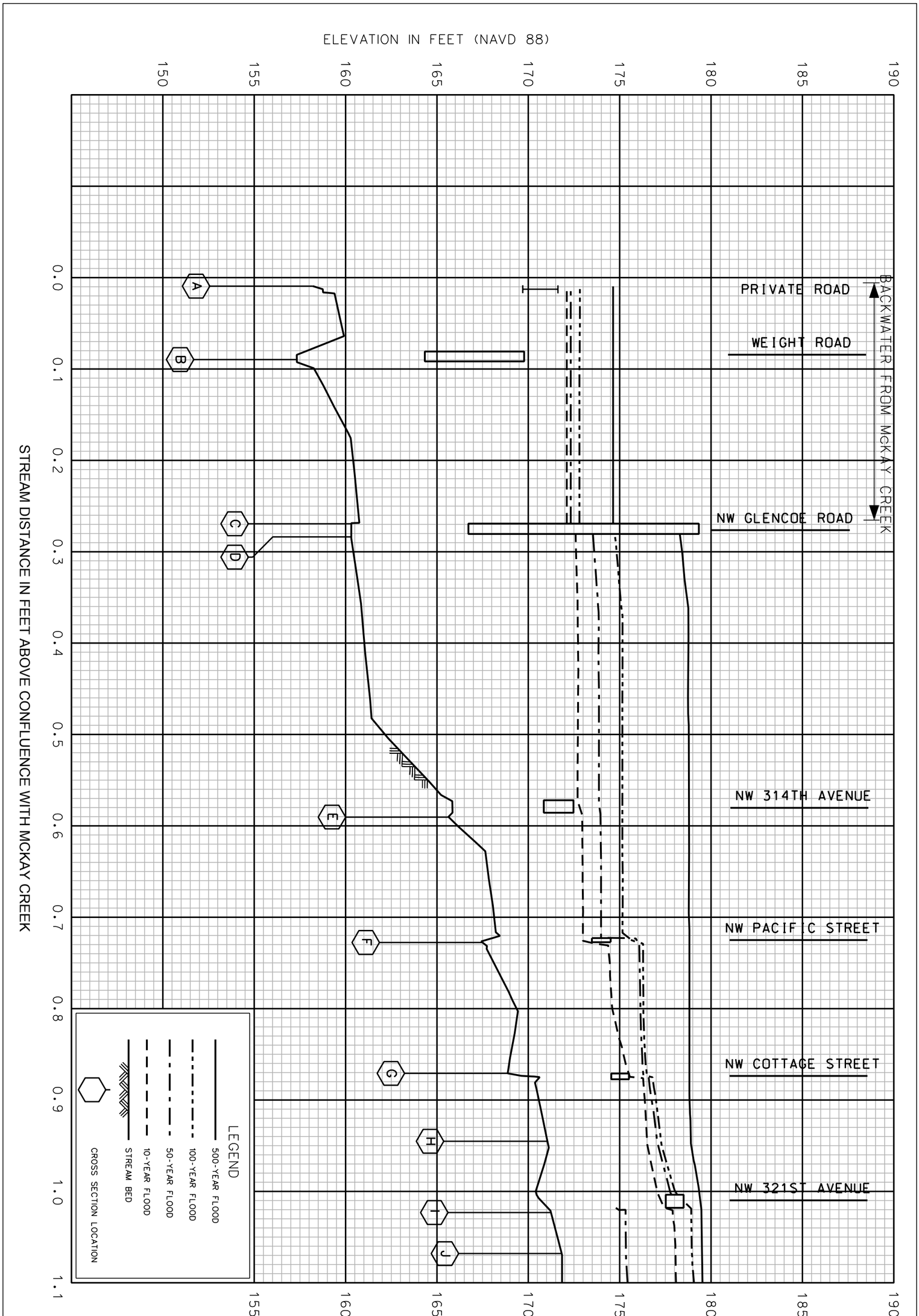
FLOOD PROFILES

TURNER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

137P



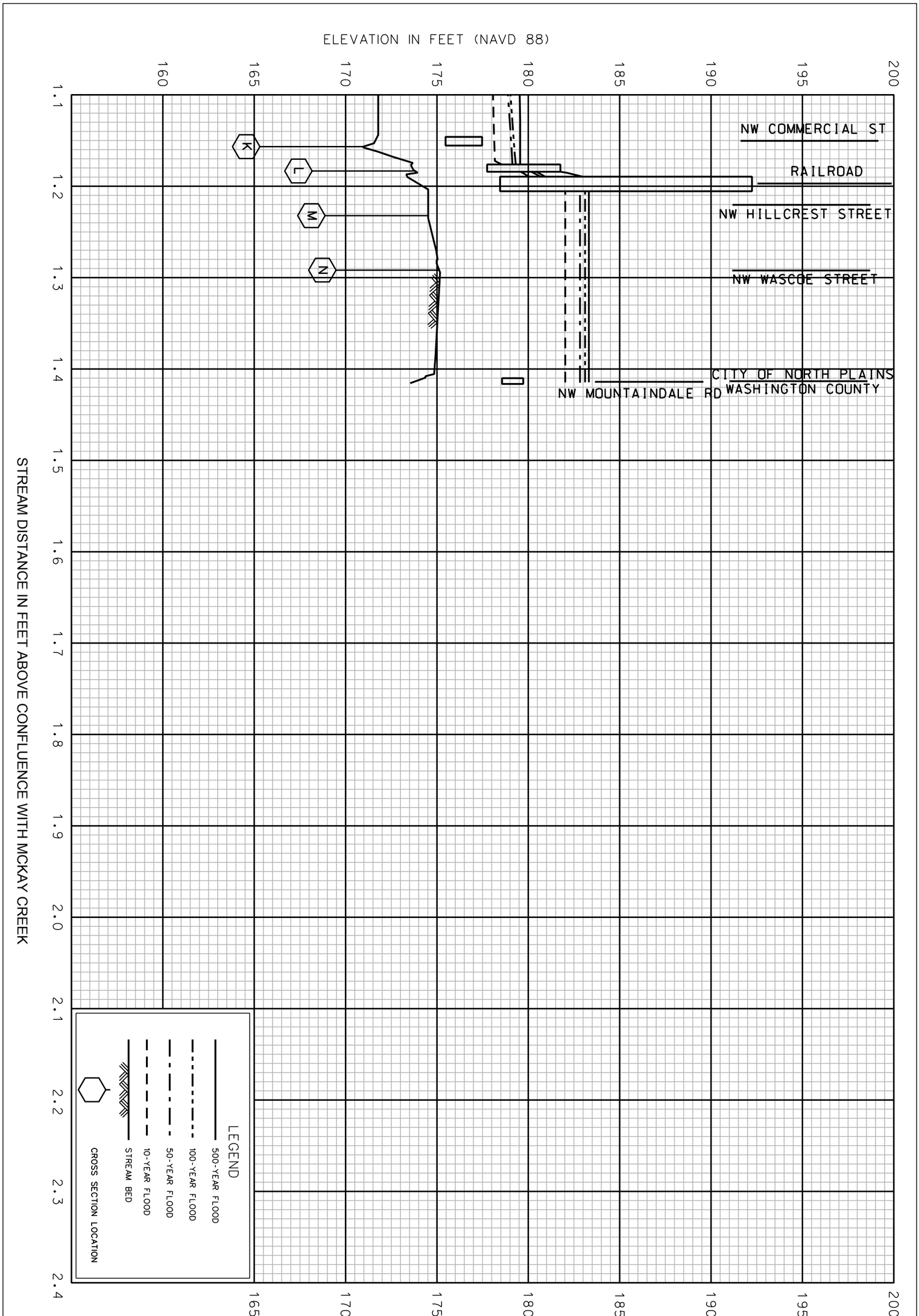
138P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

UNNAMED TRIBUTARY TO McKAY CREEK



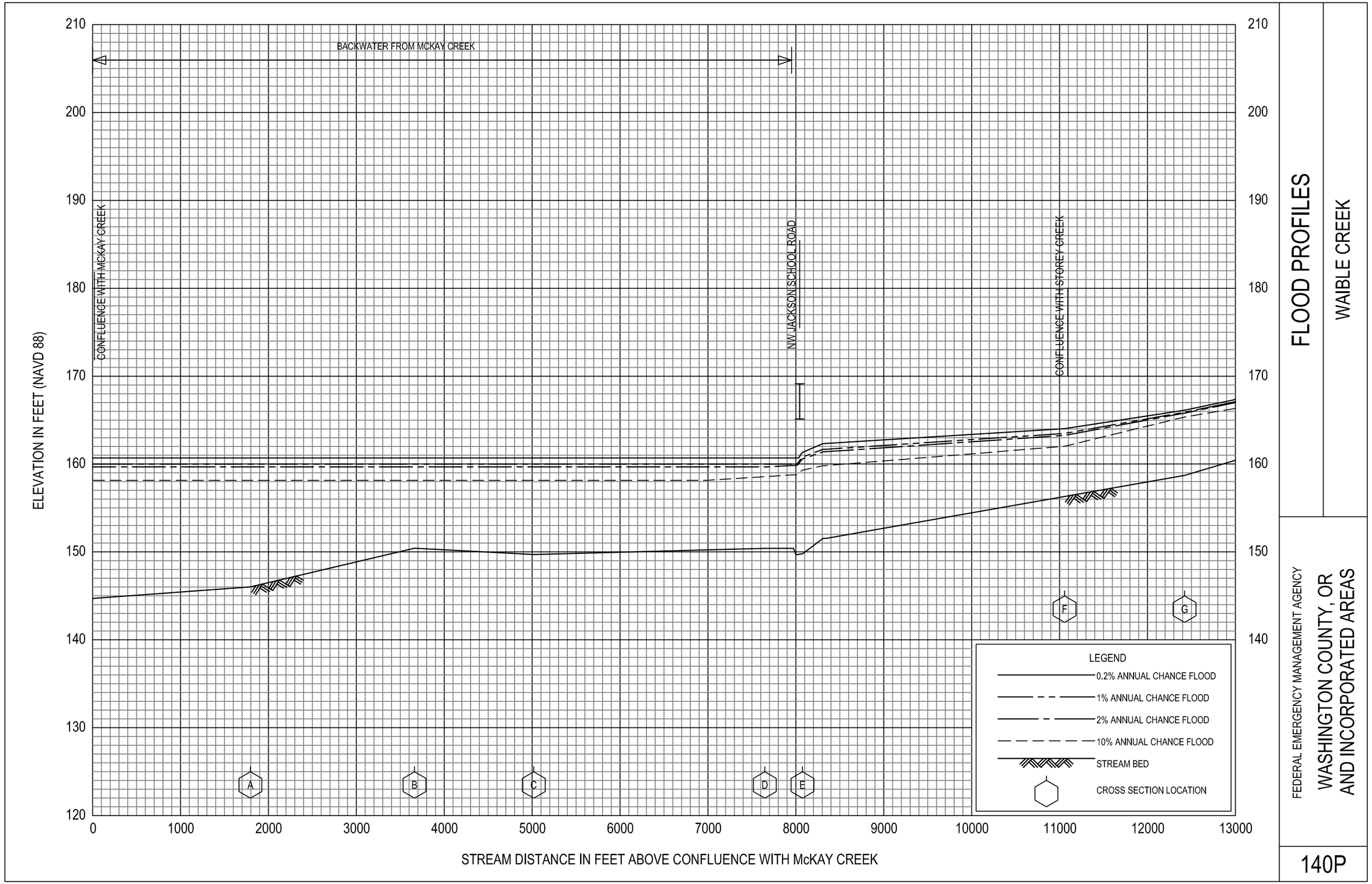
139P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

UNNAMED TRIBUTARY TO McKAY CREEK



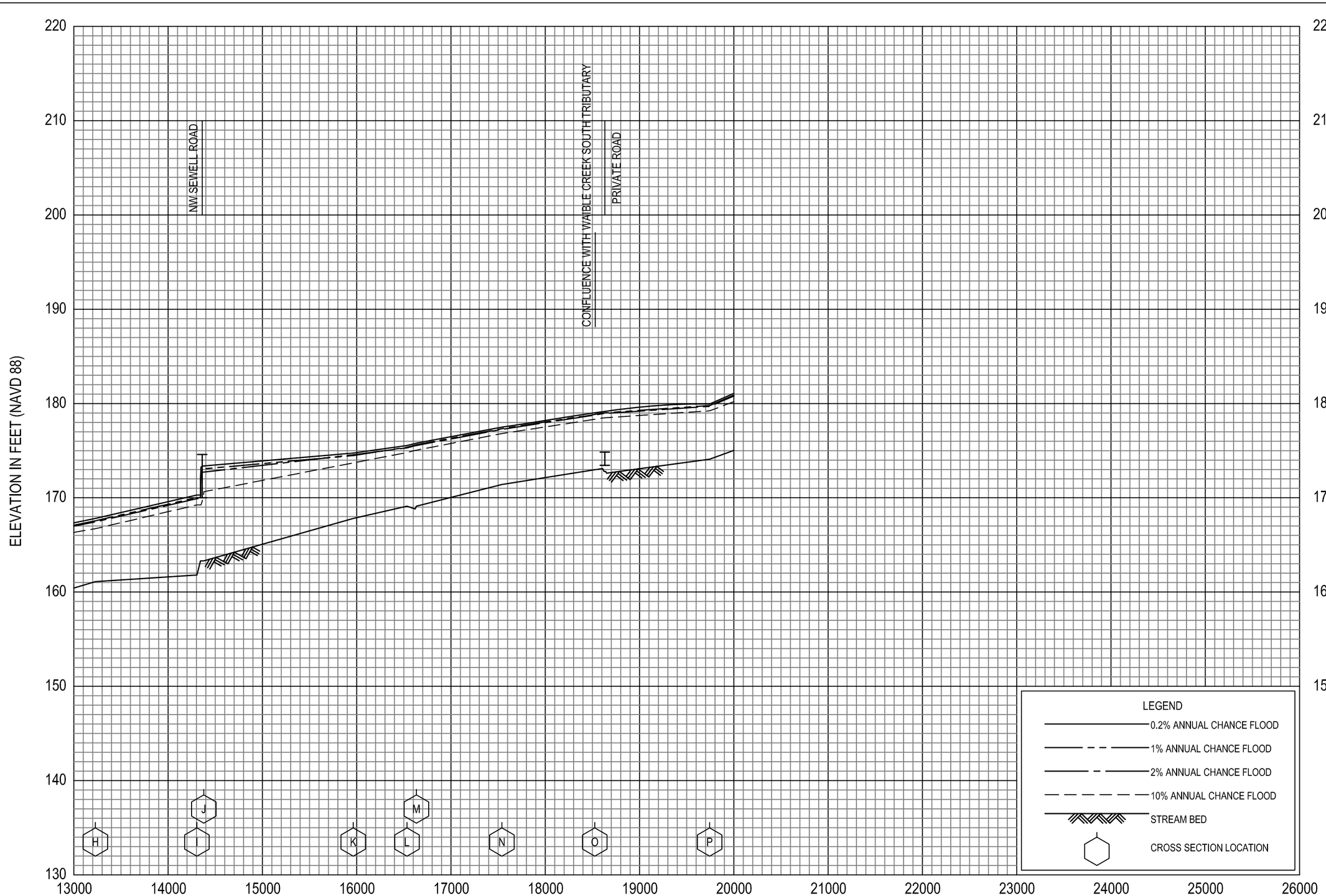
FLOOD PROFILES

WAIBLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

140P



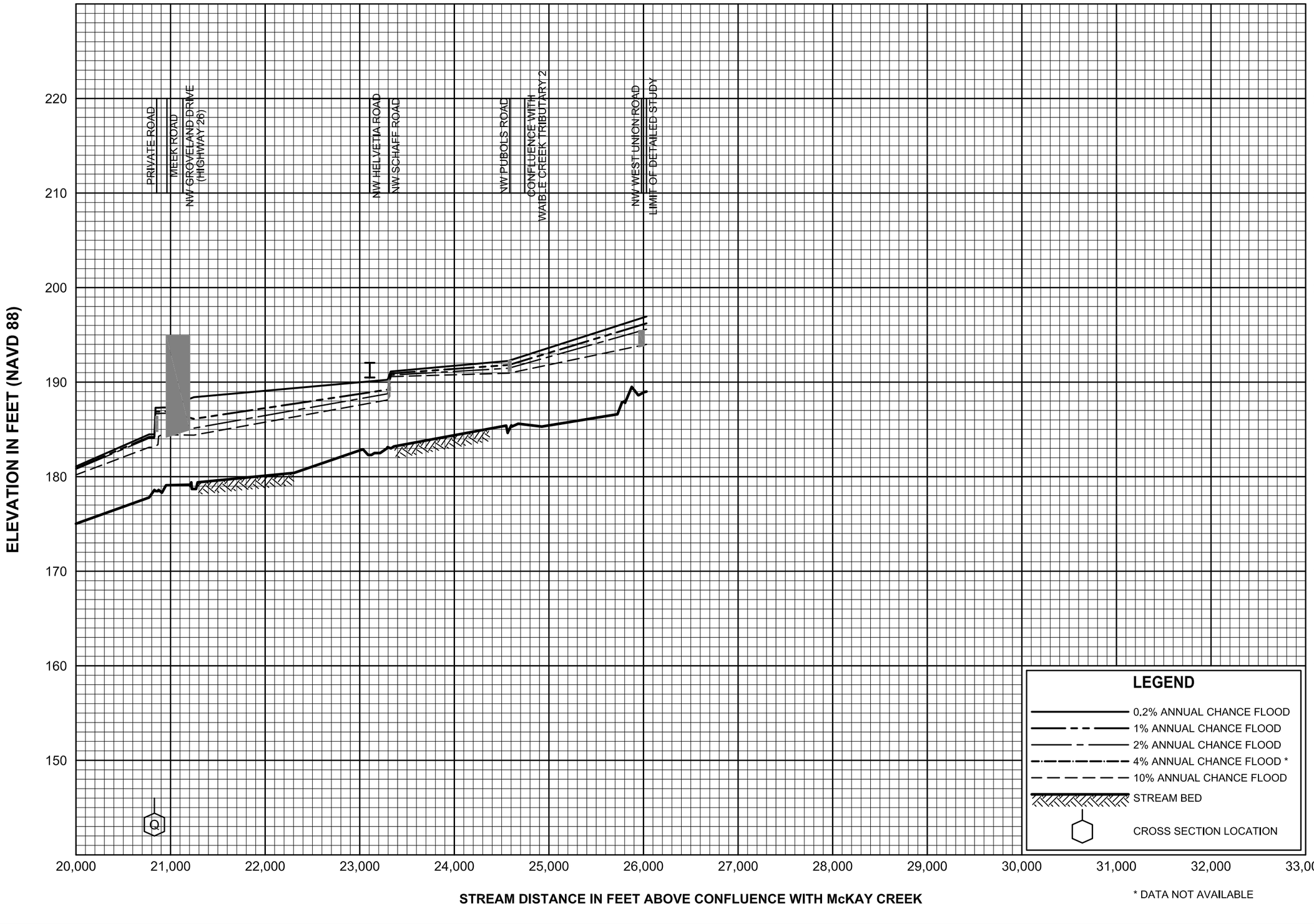
FLOOD PROFILES

WAIBLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

141P



FLOOD PROFILES

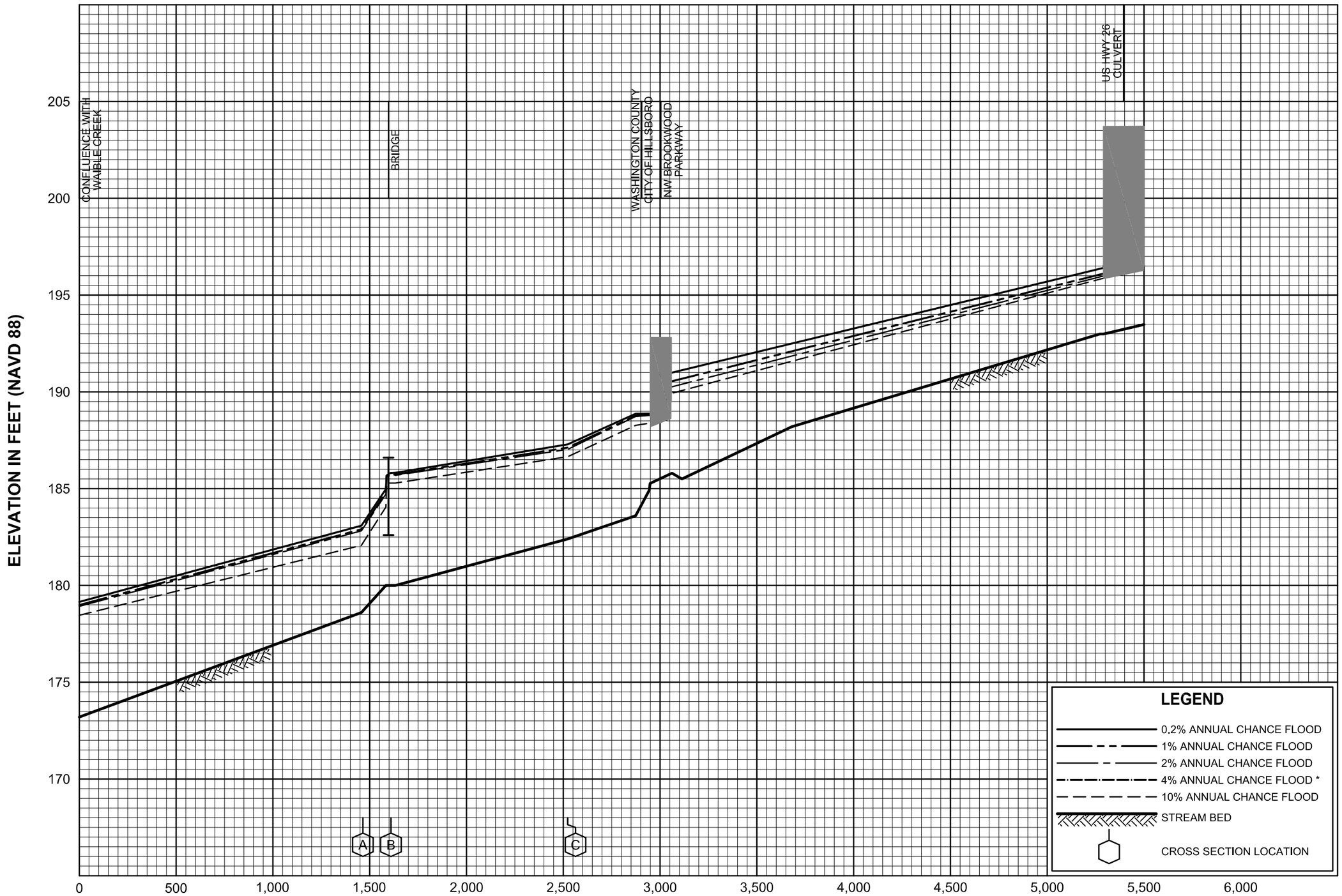
WAIBLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

142P



FLOOD PROFILES

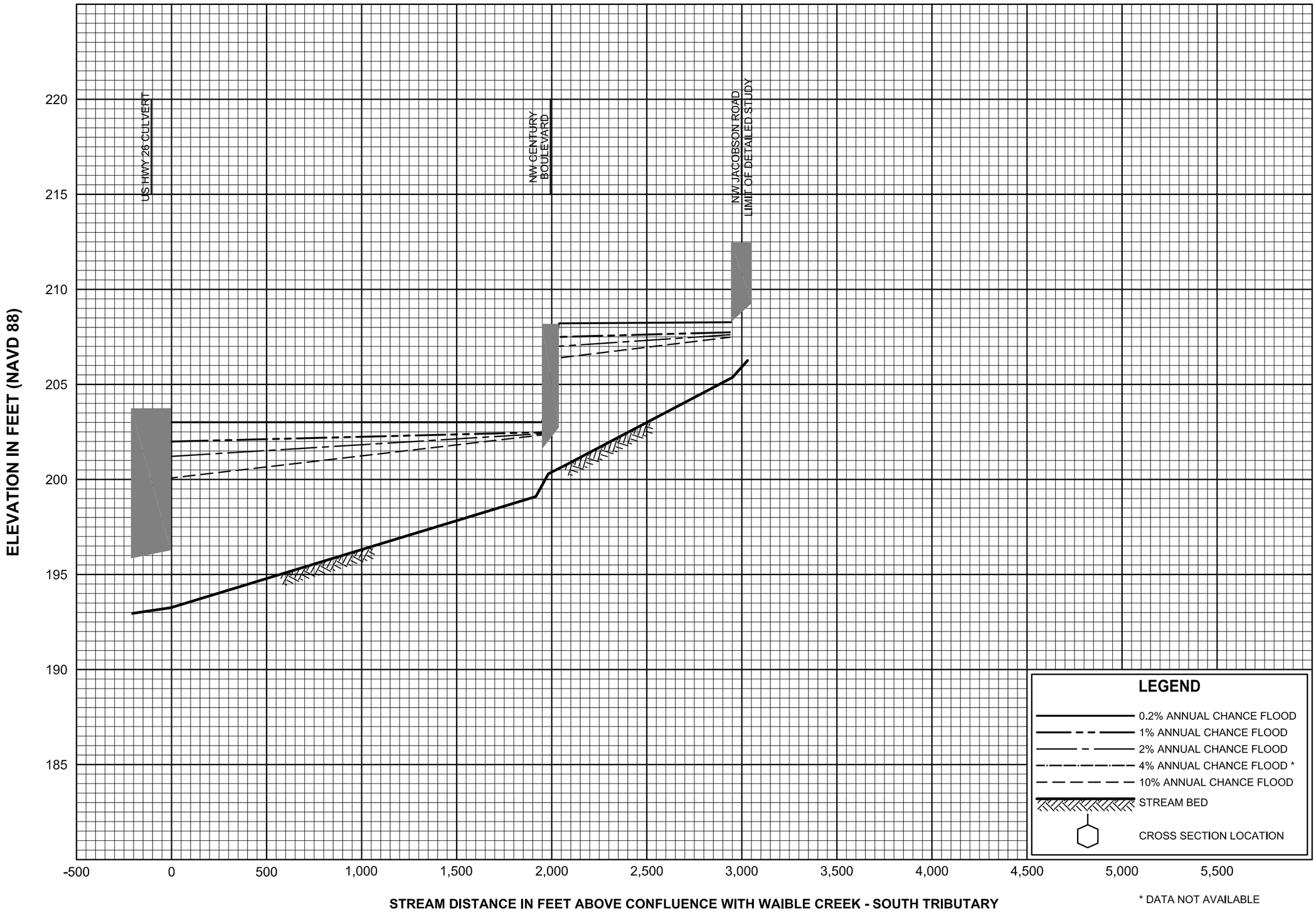
WAIBLE CREEK - SOUTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

143P



FLOOD PROFILES

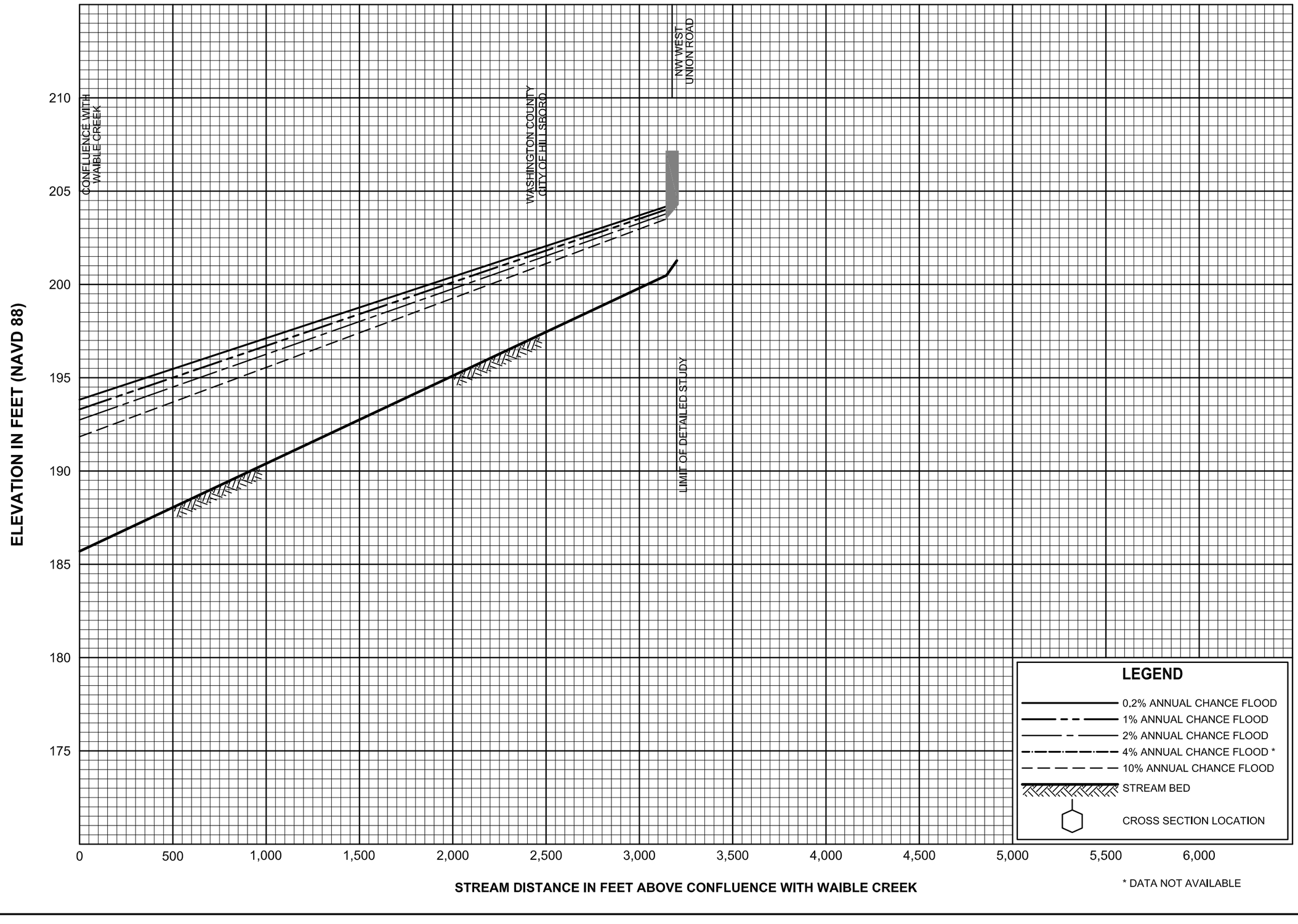
WAIBLE CREEK TRIBUTARY 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

144P



FLOOD PROFILES

WAIBLE CREEK TRIBUTARY 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR

AND INCORPORATED AREAS

145P

ELEVATIONS CONTROLLED BY TUALATIN RIVER

GASTON ROAD EAST
FARM ROAD

WASHINGTON COUNTY
CITY OF GASTON
CITY OF GASTON
WASHINGTON COUNTY

LIMIT OF DETAILED STUDY

ELEVATION IN FEET (NAVD 88)

195
190
185
180
175
170
165
160
155

A
B
C
D
E
F
G

LEGEND
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5

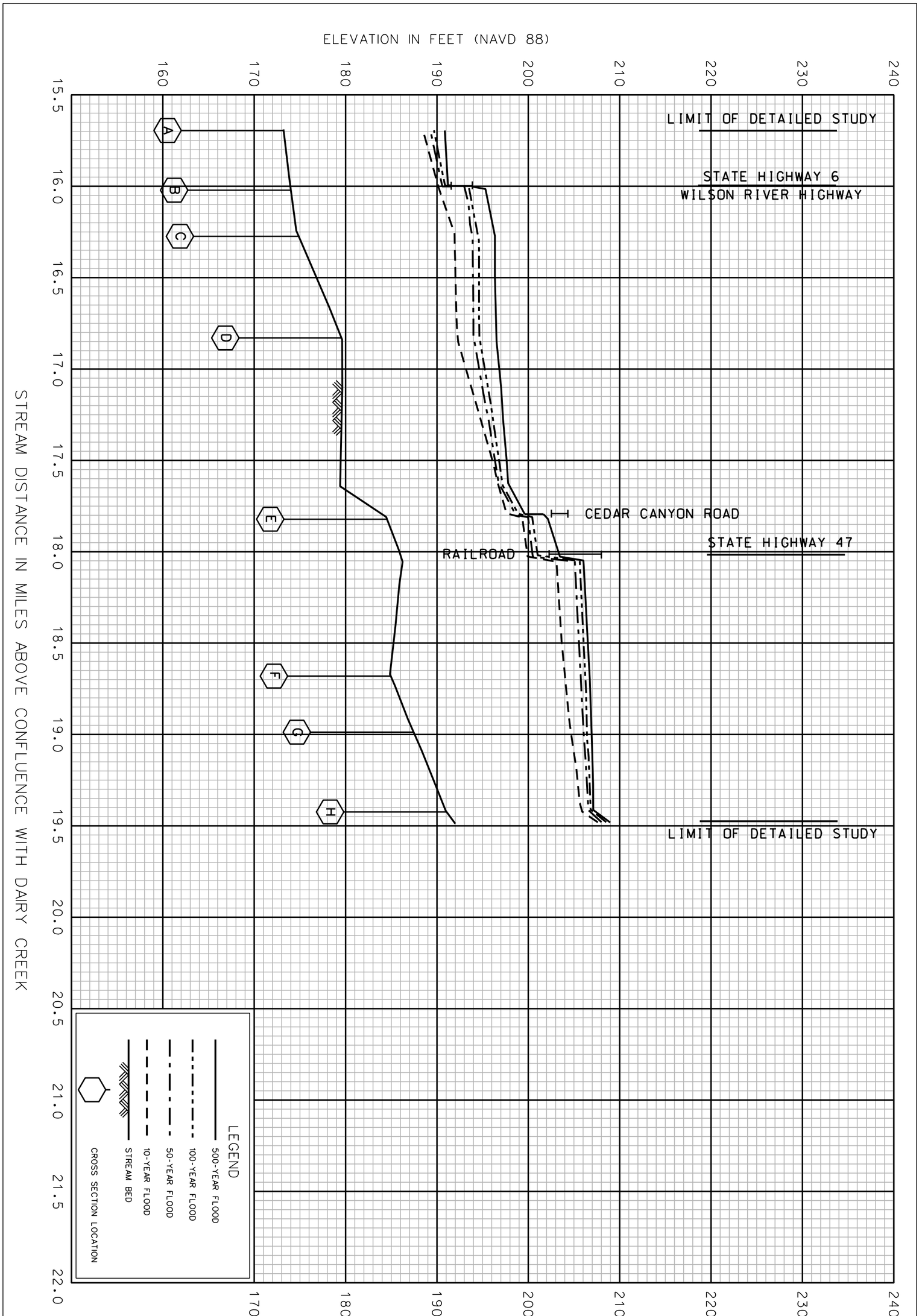
STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH TUALATIN RIVER

FLOOD PROFILES

WAPATO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

146P



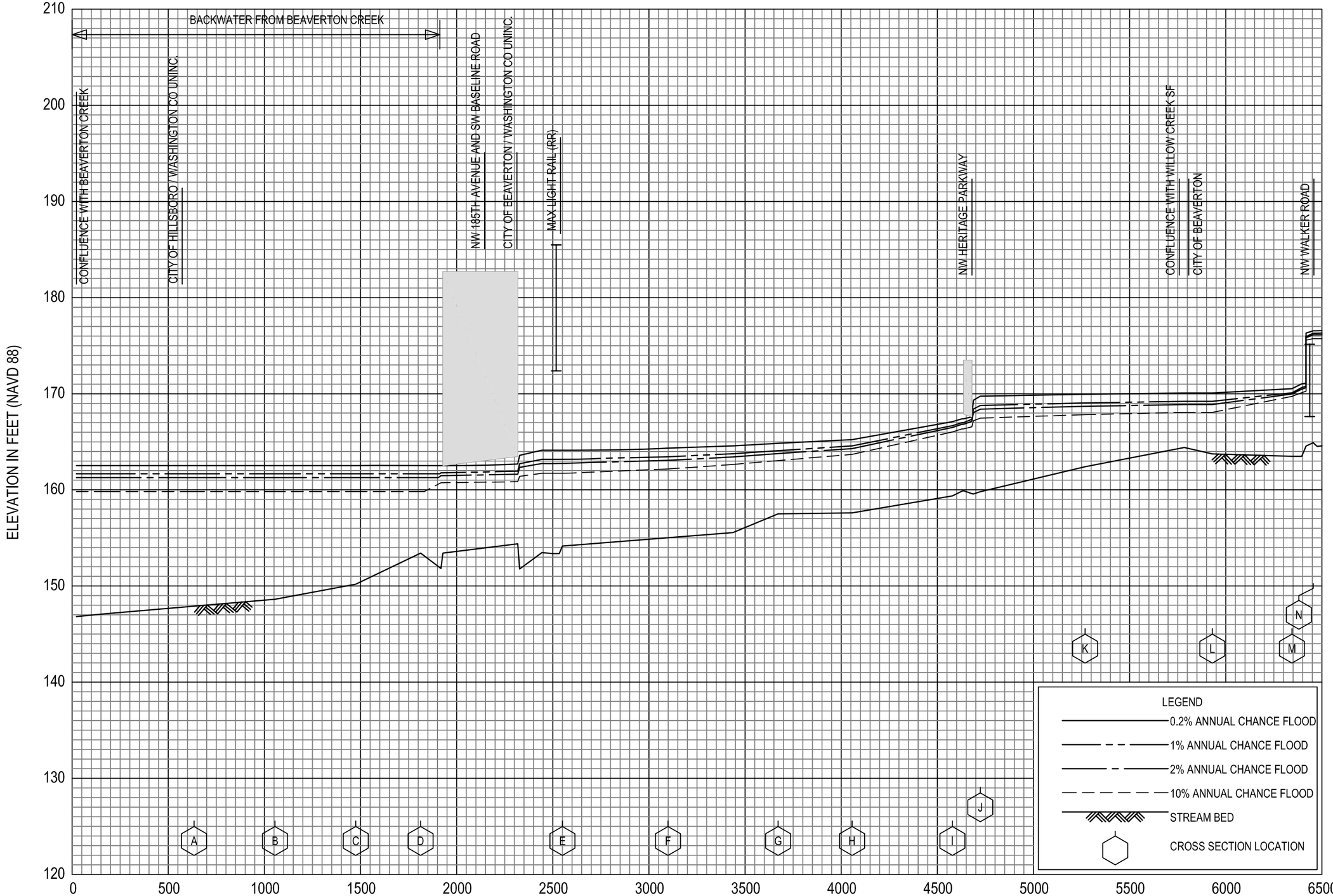
147P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR AND INCORPORATED AREAS

FLOOD PROFILES

WEST FORK DAIRY CREEK



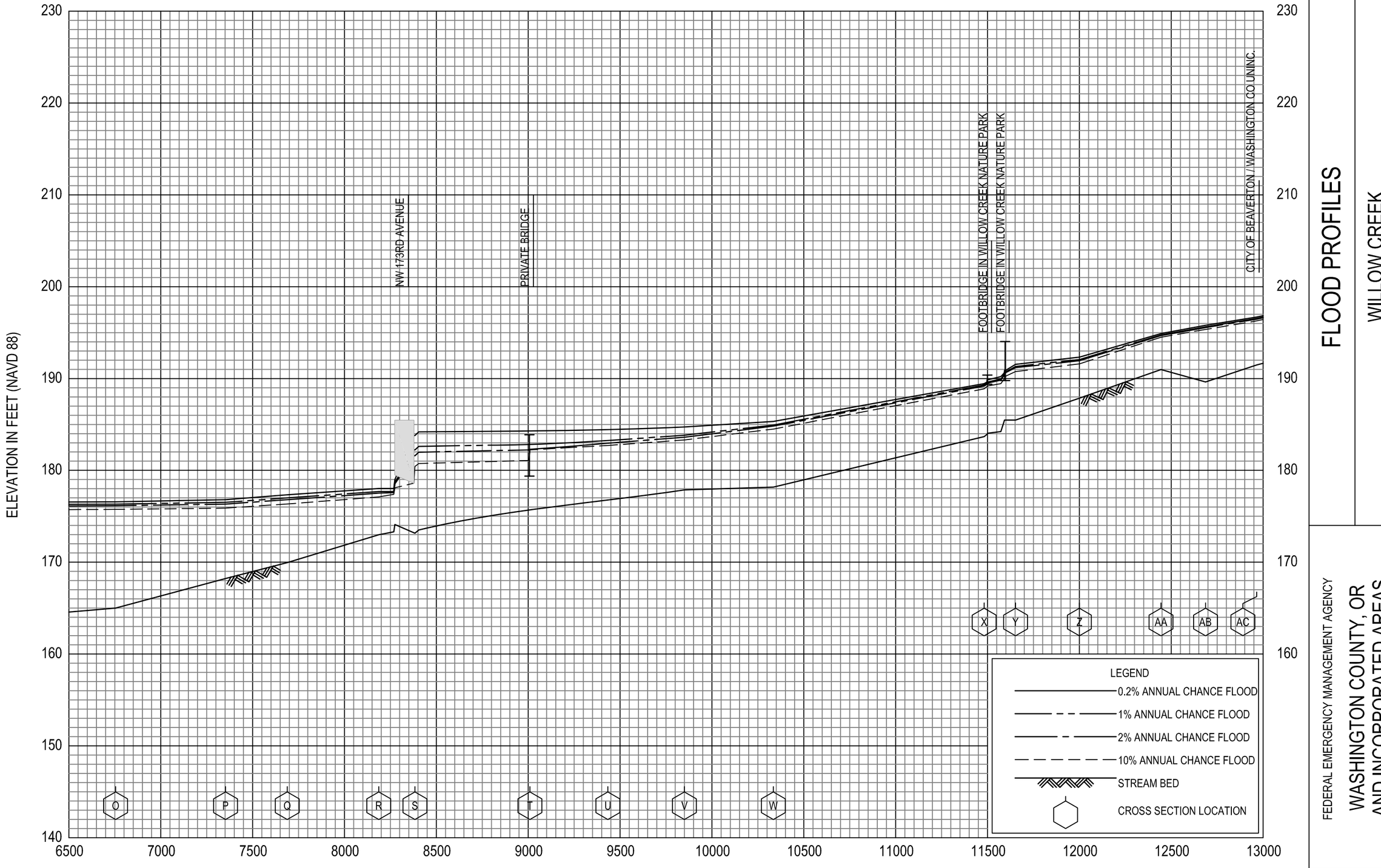
FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

148P



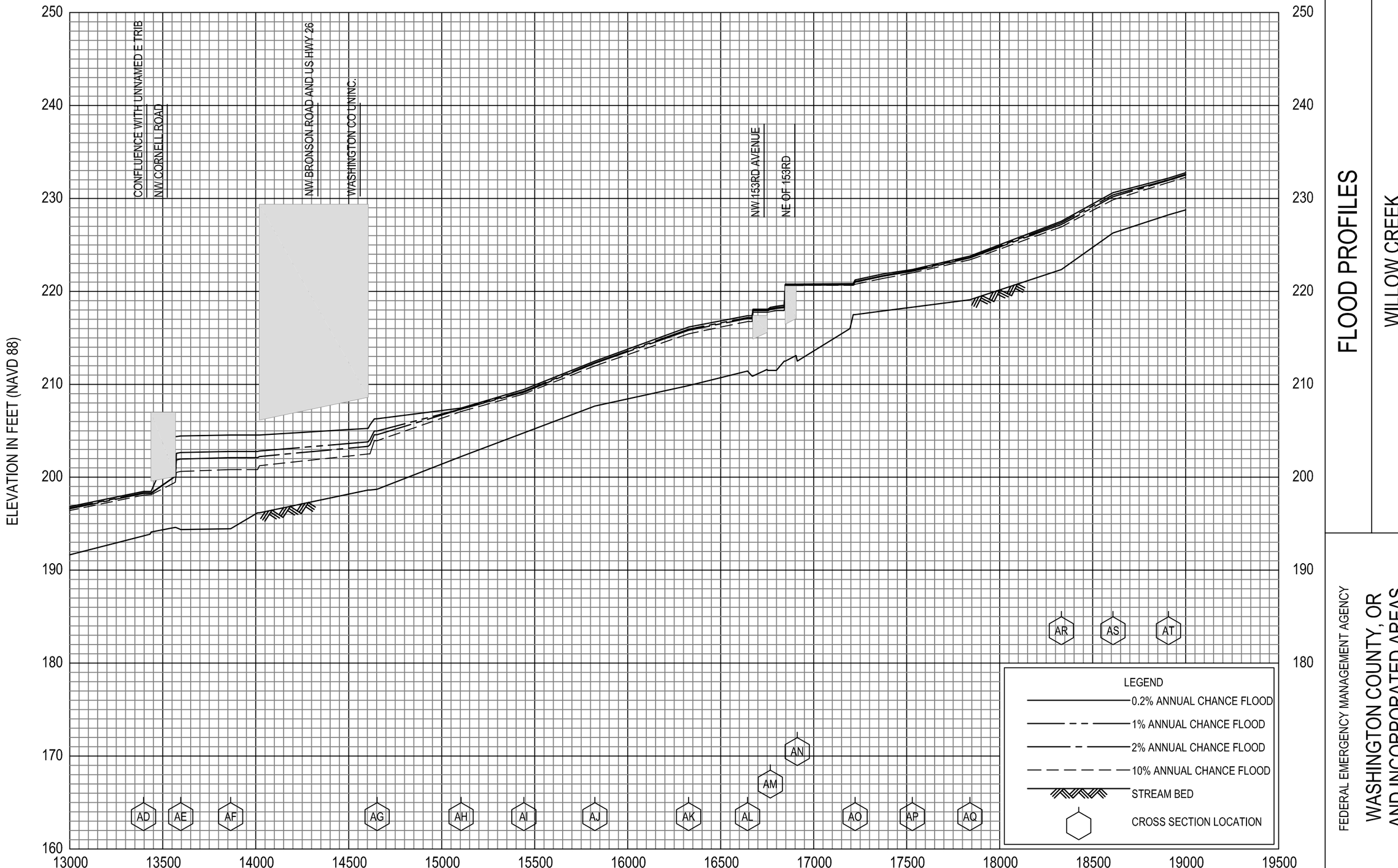
FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

149P



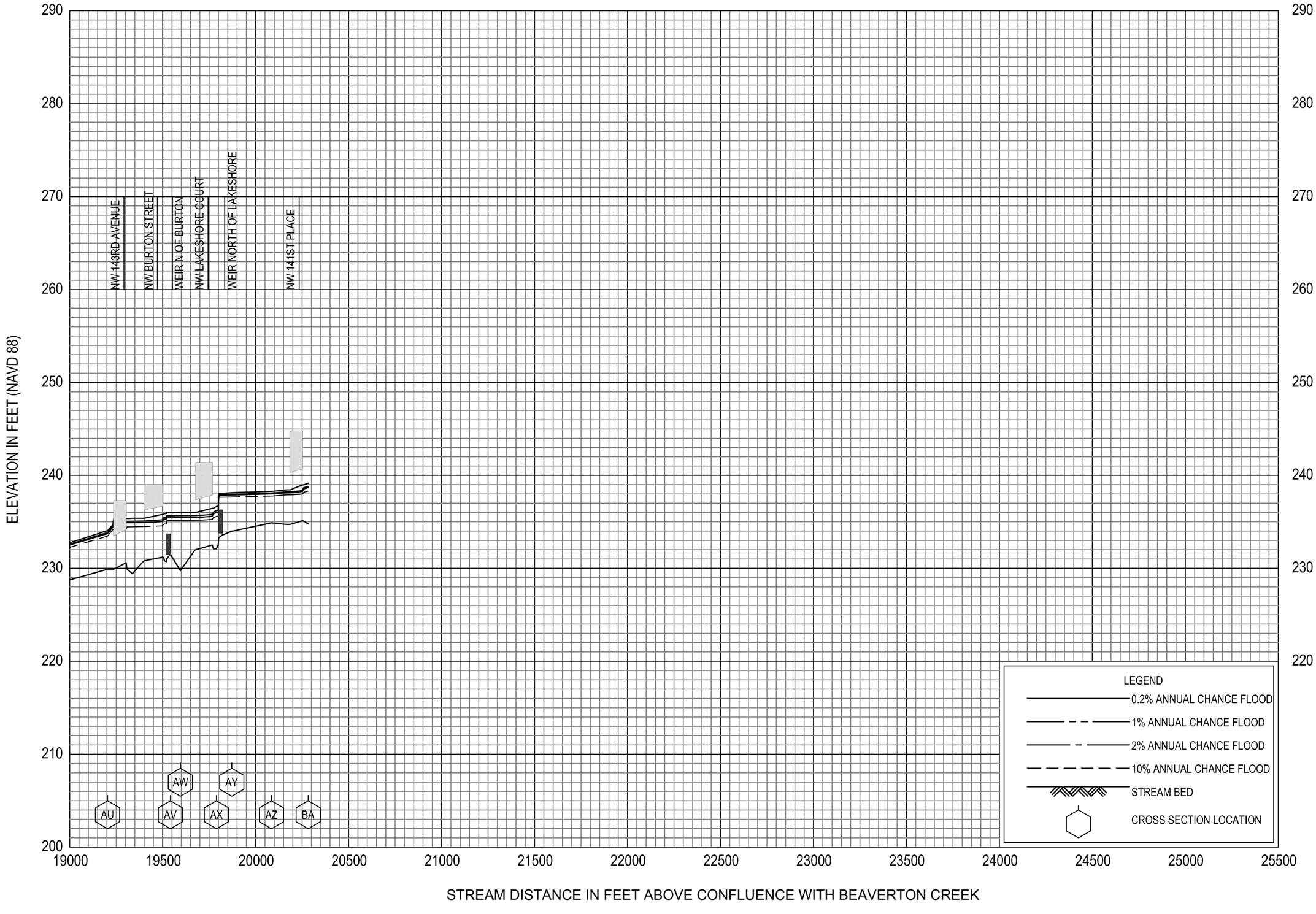
FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

150P



FLOOD PROFILES

WILLOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

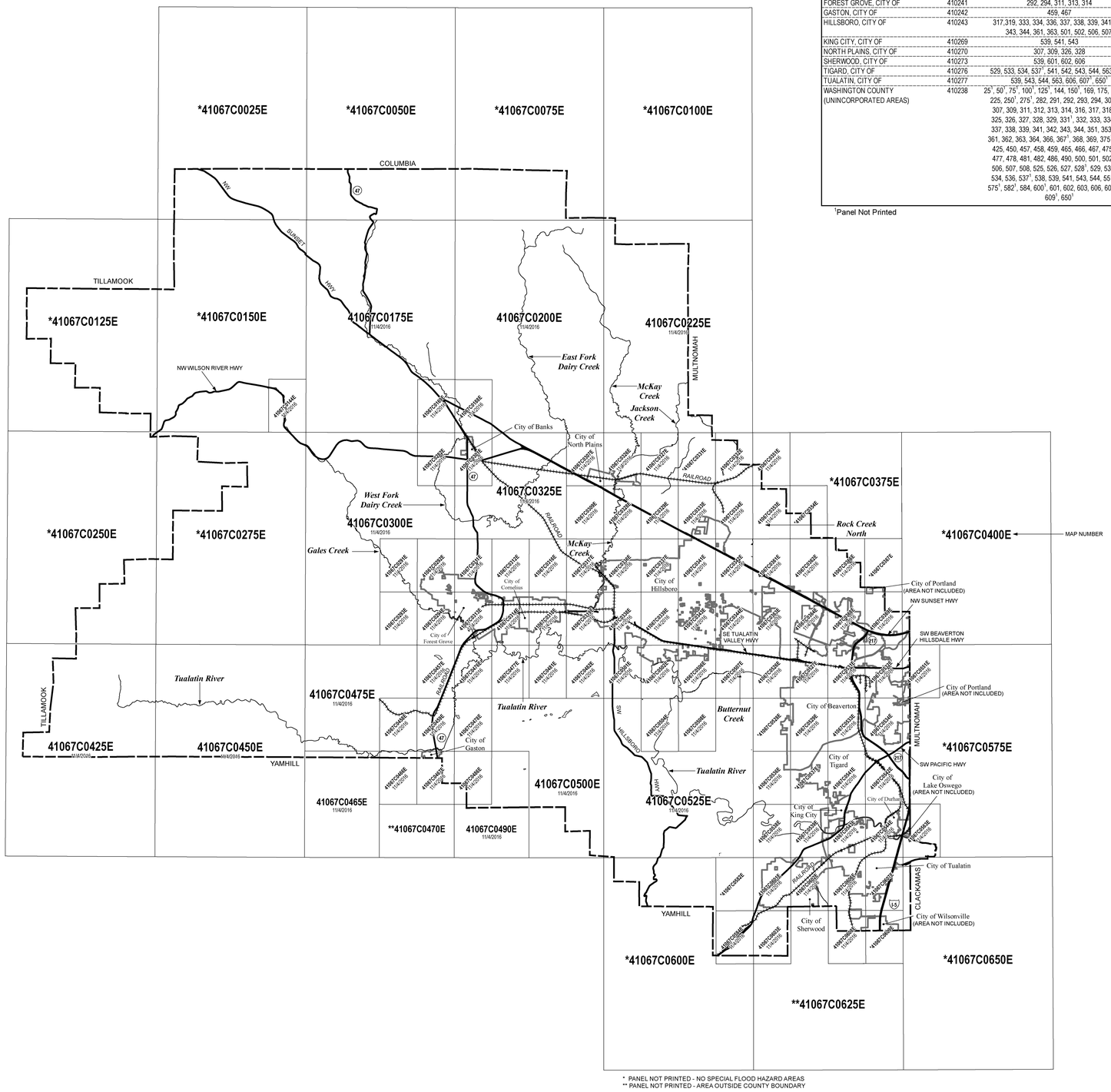
WASHINGTON COUNTY, OR
AND INCORPORATED AREAS

151P

LISTING OF COMMUNITIES

COMMUNITY NAME	COMMUNITY NUMBER	LOCATED ON PANEL(S)	INITIAL NFIP MAP DATE	INITIAL FIRM DATE	MOST RECENT FIRM PANEL DATE
BANKS, CITY OF	410239	301	November 4, 2016	November 4, 2016	November 4, 2016
BEAVERTON, CITY OF	410240	361, 362, 363, 364, 368, 369, 400[1], 526, 527, 528[1] 529, 531, 532, 533, 534, 536, 537[1], 551, 575[1]	February 1, 1974	September 28, 1984	November 4, 2016
CORNELIUS, CITY OF	410261	314, 318, 319	November 5, 1976	January 6, 1982	November 4, 2016
DURHAM, CITY OF	410263	544	November 12, 1976	January 6, 1982	November 4, 2016
FOREST GROVE, CITY OF	410241	292, 294, 311, 313, 314	March 1, 1974	March 15, 1982	November 4, 2016
GASTON, CITY OF	410242	459, 467	July 5, 1982	July 5, 1982	November 4, 2016
HILLSBORO, CITY OF	410243	317,319, 333, 334, 336, 337, 338, 339, 341, 342 343, 344, 361, 363, 501, 502, 506, 507	April 12, 1974	May 17, 1982	November 4, 2016
KING CITY, CITY OF	410269	539, 541, 543	February 18, 2005	February 18, 2005	November 4, 2016
NORTH PLAINS, CITY OF	410270	307, 309, 326, 328	July 16, 1976	April 1, 1982	November 4, 2016
SHERWOOD, CITY OF	410273	539, 601, 602, 606	August 13, 1976	January 6, 1982	November 4, 2016
TIGARD, CITY OF	410276	529, 533, 534, 537[1], 541, 542, 543, 544, 563, 575[1]	February 14, 1978	March 1, 1982	November 4, 2016
TUALATIN, CITY OF	410277	539, 543, 544, 563, 606, 607[1], 650[1]	May 20, 1977	February 17, 1982	November 4, 2016
WASHINGTON COUNTY (UNINCORPORATED AREAS)	410238	25[1], 50[1], 75[1], 100[1], 125[1], 144, 150[1], 169, 175, 188, 200 225, 250[1], 275[1], 282, 291, 292, 293, 294, 300, 301 307, 309, 311, 312, 313, 314, 316, 317, 318, 319 325, 326, 327, 328, 329, 331[1], 332, 333, 334, 336 337, 338, 339, 341, 342, 343, 344, 351, 353, 354[1] 361, 362, 363, 364, 366, 367[1], 368, 369, 375[1], 400[1] 425, 450, 457, 458, 459, 465, 466, 467, 475, 476 477, 478, 481, 482, 486, 490, 500, 501, 502, 504 506, 507, 508, 525, 526, 527, 528[1], 529, 531, 532 534, 536, 537[1], 538, 539, 541, 543, 544, 551, 563 575[1], 582[1], 584, 600[1], 601, 602, 603, 606, 607[1], 608 609[1], 650[1]	January 24, 1975	September 30, 1982	November 4, 2016

[1]Panel Not Printed



* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
** PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY

MAP DATES

This FIRM Index displays the map date for each FIRM panel at the time that this Index was printed. Because this index may not be distributed to unaffected communities in subsequent revisions, users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center (MSC) website at http://msc.fema.gov or by calling the MSC via the FEMA Map Information eXchange (FMIX) at 1-877-336-2627.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

NOTE TO USERS

Future revisions to this FIRM Index will only be issued to communities that are located on FIRM panels being revised. This FIRM Index therefore remains valid for FIRM panels dated November 4, 2016 or earlier. Please refer to the 'MOST RECENT FIRM PANEL DATE' column in the Listing of Communities table to determine the most recent FIRM index date for each community.

ELEVATION DATUM

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242
(301) 713-4172 (fax)

BASE MAP SOURCE

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by the Metro Data Resources Center. This information was compiled from many local sources and includes transportation features, water features, political boundaries, and Public Land Survey System features.

MAP REPOSITORIES

(Maps available for reference only, not for distribution)

BANKS, CITY OF
City Administrative Offices
13680 Northwest Main Street
Banks, Oregon 97106

BEAVERTON, CITY OF
Community Development Department
4755 Southwest Griffith Drive
Beaverton, Oregon 97005

CORNELIUS, CITY OF
Planning Department
1300 South Kodiak Circle
Cornelius, Oregon 97113

DURHAM, CITY OF
City Hall
17160 Southwest Upper Boones Ferry Road
Durham, Oregon 97224

FOREST GROVE, CITY OF
City Hall
1924 Council Street
Forest Grove, Oregon 97116

GASTON, CITY OF
City Hall
116 Front Street
Gaston, Oregon 97119

HILLSBORO, CITY OF
City Hall
150 East Main Street
Hillsboro, Oregon 97123

KING CITY, CITY OF
City Hall
15300 Southwest 116th Avenue
King City, Oregon 97224

NORTH PLAINS, CITY OF
City Hall
31360 Northwest Commercial Street
North Plains, Oregon 97133

SHERWOOD, CITY OF
City Hall
22560 Southwest Pine Street
Sherwood, Oregon 97140

TIGARD, CITY OF
City Hall
13125 Southwest Hall Boulevard
Tigard, Oregon 97223

TUALATIN, CITY OF
City Hall
18880 Southwest Martinazzi Avenue
Tualatin, Oregon 97062

WASHINGTON COUNTY
(Unincorporated Areas)
County Public Services Building
155 North First Avenue
Suite 350
Hillsboro, Oregon 97124

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

MAP INDEX

FIRM
FLOOD INSURANCE RATE MAP
WASHINGTON COUNTY, OREGON
AND INCORPORATED AREAS
(SEE LISTING OF COMMUNITIES TABLE)

MAP INDEX

PANELS PRINTED : 144, 169,175, 188, 200, 225, 282, 291, 292, 293, 294,300, 301, 307, 309, 311, 312, 313, 314, 316, 317, 318, 319, 325, 326, 327, 328, 329, 332, 333, 334, 336, 337, 338, 339, 341,342, 343, 344, 351, 353, 361, 362, 363, 364, 366, 368, 369, 425, 450, 457, 458, 459, 465, 466, 467, 475, 476, 477, 478, 481, 482, 486, 490, 500, 501, 502, 504, 506, 507, 508, 525, 526, 527, 529, 531, 532, 533, 534, 536, 538, 539, 541, 542, 543, 544, 551, 563, 584, 601, 602, 603, 606, 608

MAP NUMBER
41067CIND0A

EFFECTIVE DATE
NOVEMBER 4, 2016

Federal Emergency Management Agency

NOTES TO USERS

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National Geodetic Survey
SSMC-3, #9202
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Silver Spring, MD 20910-3282

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SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A	No Base Flood Elevations determined.
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ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet *
(EL 978)	Base Flood Elevation value where uniform within zone; elevation in feet*

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A — A	Cross section line
23 — 23	Transect line
97°10'30.5",32°10'30.5"	Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
$^{42}76^{000}$mE	1000-meter Universal Transverse Mercator grid values, zone 10
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M1.5	River Mile
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EFFECTIVE DATE OF COUNTYWIDE
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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0539E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

PANEL 539 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KING CITY, CITY OF	410269	0539	E
SHERWOOD, CITY OF	410273	0539	E
TUALATIN, CITY OF	410277	0539	E
WASHINGTON COUNTY	410238	0539	E

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MAP NUMBER
41067C0539E

EFFECTIVE DATE
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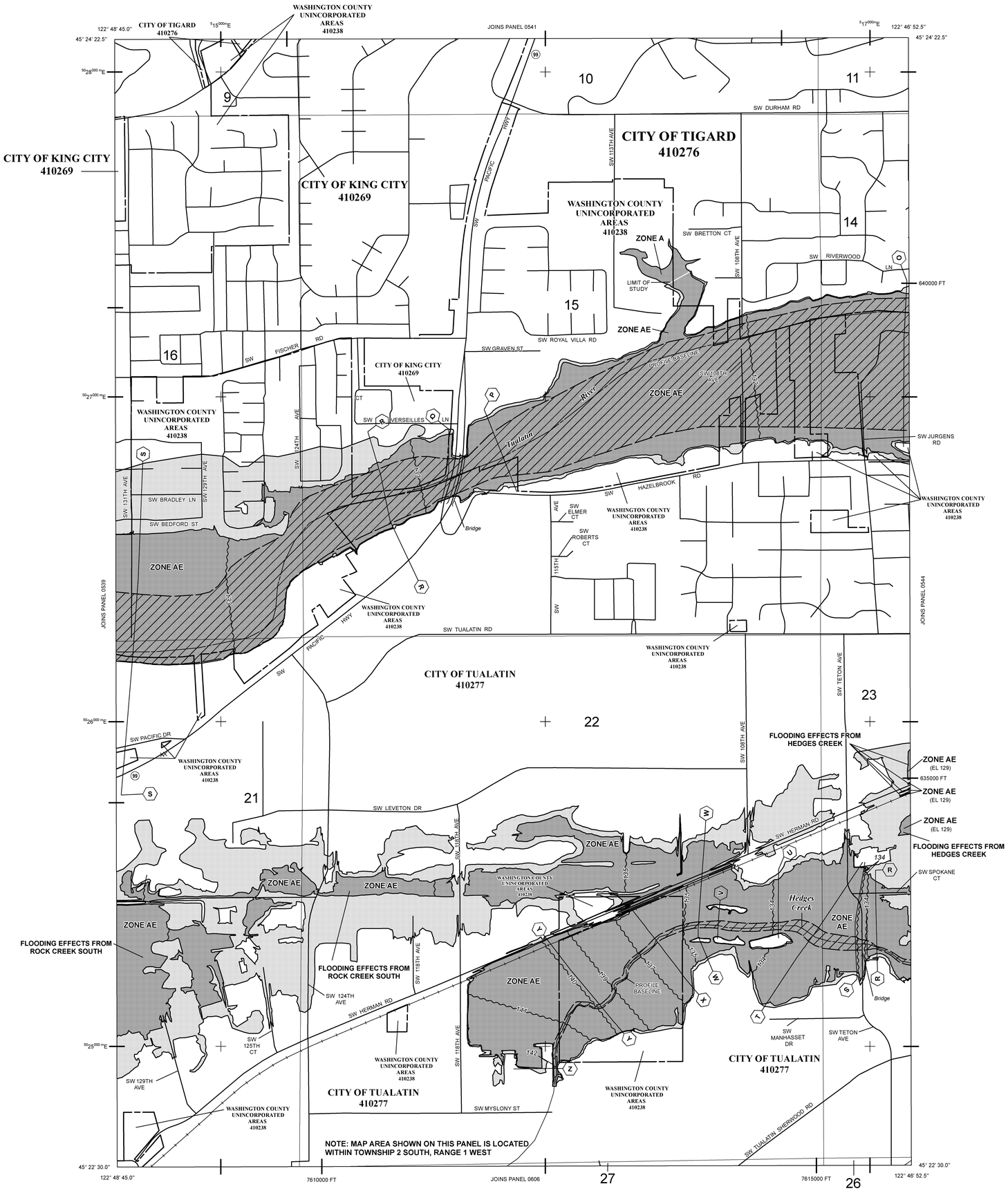
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OTHER FLOOD AREAS

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- 513 — Base Flood Elevation line and value; elevation in feet *
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NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0543E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

PANEL 543 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

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KING CITY, CITY OF	410269	0543	E
TUALATIN, CITY OF	410277	0543	E
WASHINGTON COUNTY	410238	0543	E

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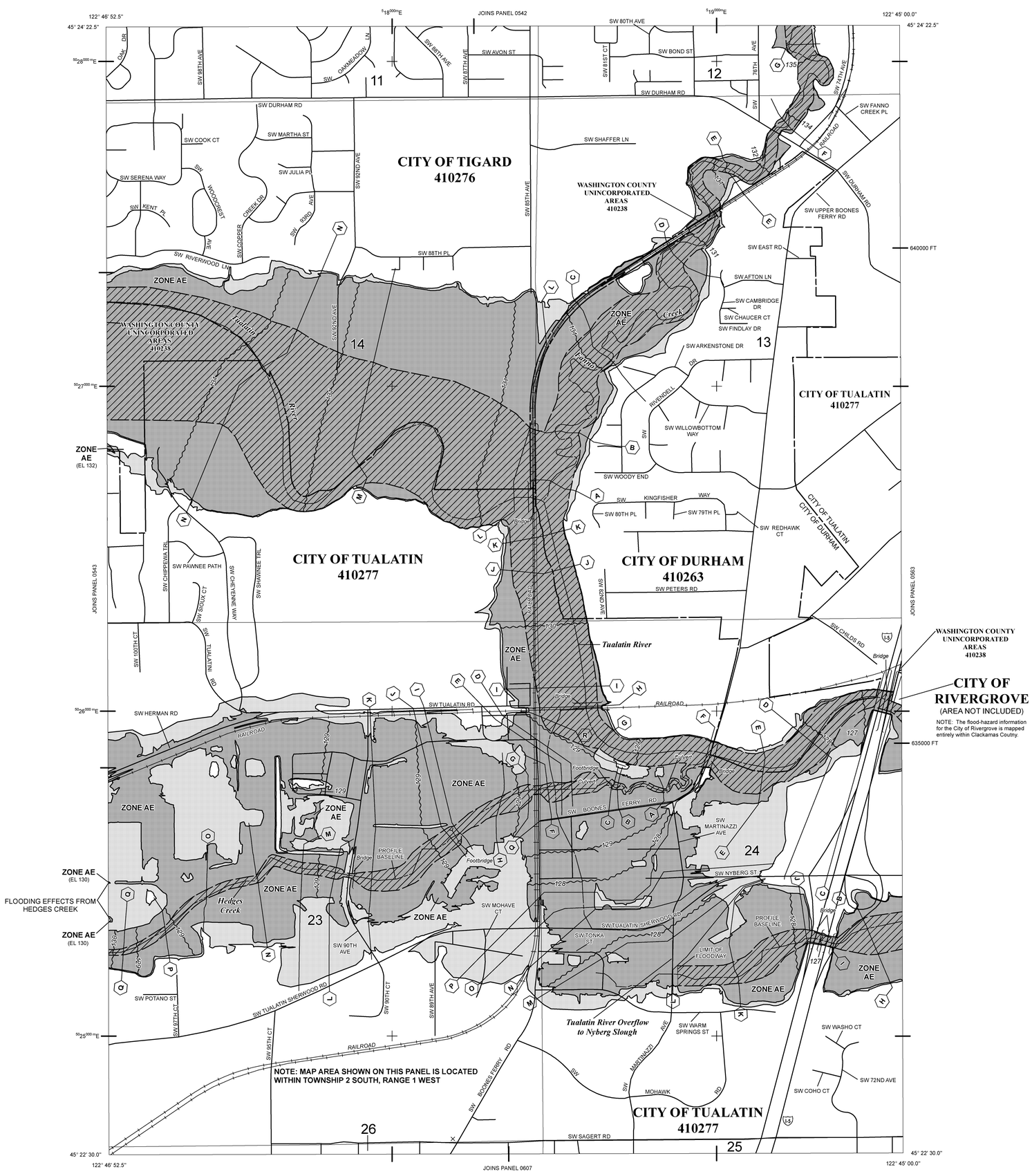
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PANEL 0544E

FIRM

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WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

PANEL 544 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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41067C0544E

EFFECTIVE DATE
NOVEMBER 4, 2016

Federal Emergency Management Agency

NOTES TO USERS

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Silver Spring, MD 20910-3282

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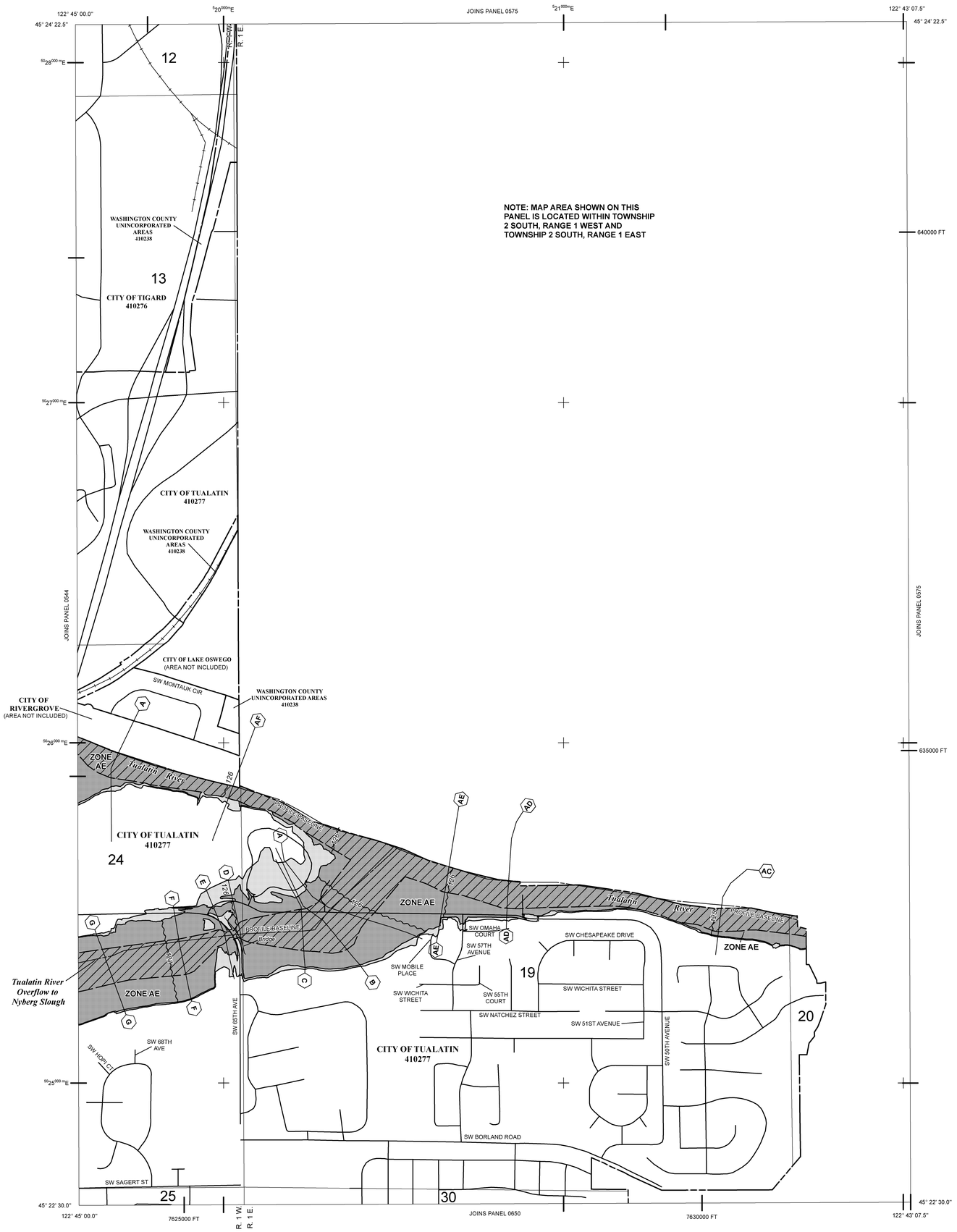
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For information on available products associated with this FIRM visit the **FEMA Flood Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance of greater flood event.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones, and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet *
(EL 978)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
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97°10'30.5",32°10'30.5"	Geographic coordinates referenced to North American Datum of 1983 (NAD 83)
$^{42}76^{000m}$E	1000-meter Universal Transverse Mercator grid values, zone 10
600000 FT	5000-foot grid ticks: Oregon State Plane coordinate system, North zone (FIPSZONE 3601), Lambert Conformal Conic projection
MG5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
•M1.5	River Mile
	Aqueduct, Culvert, Flume, Penstock, or Storm Sewer
	Road or Railroad Bridge

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
November 4, 2016

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0563E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

PANEL 563 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TIGARD, CITY OF	410276	0563	E
TUALATIN, CITY OF	410277	0563	E
WASHINGTON COUNTY	410238	0563	E

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MAP NUMBER 41067C0563E

EFFECTIVE DATE NOVEMBER 4, 2016

Federal Emergency Management Agency

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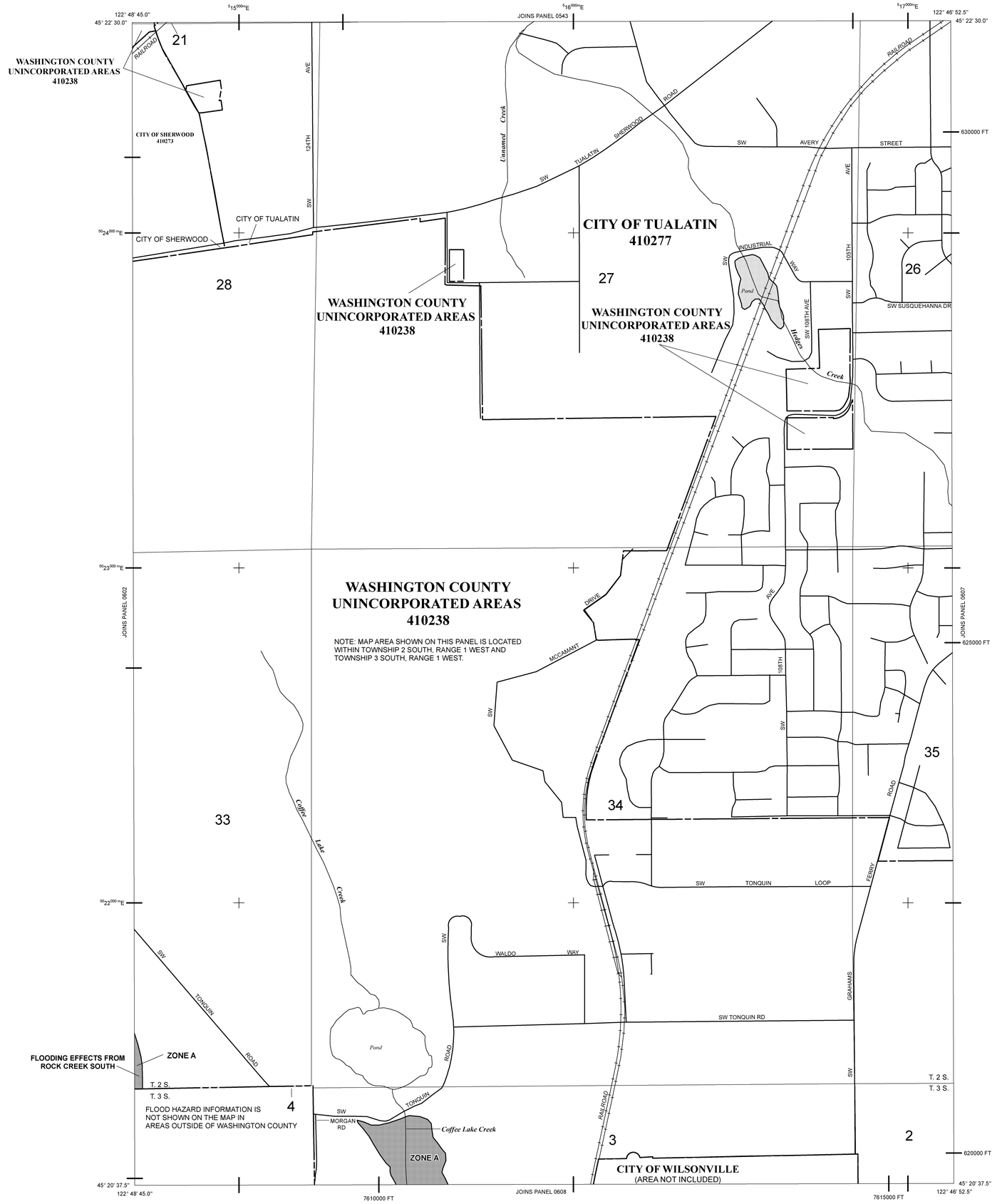
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NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0606E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, OREGON AND INCORPORATED AREAS

PANEL 606 OF 650

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SHERWOOD, CITY OF	410273	0606	E
TUALATIN, CITY OF	410277	0606	E
WASHINGTON COUNTY	410238	0606	E

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MAP NUMBER 41067C0606E

EFFECTIVE DATE NOVEMBER 4, 2016

Federal Emergency Management Agency

STAFF REPORT
CITY OF TUALATIN

TO: Tualatin Planning Commissioners

FROM: Charles Benson, Associate Planner

DATE: 09/15/2016

SUBJECT: Mobile Food Units (Food Carts): Research Results and Regional Examples

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ISSUE BEFORE TPC:

Staff will provide an update to Commission on the results of research conducted by staff on regional regulatory practices contained in ordinances regulating food carts and pods recently adopted by similarly-sized jurisdictions in the Portland metropolitan area. Staff will also provide an update on mobile unit (food cart) activity in Tualatin since adoption of temporary rules by Ordinance 1393-16 (see Attachment A).

RECOMMENDATION:

Review and discuss input received from staff and provide direction on possible ordinance components.

EXECUTIVE SUMMARY:

Staff presented a project framework, including a timeline with milestones (see Attachment B), to the City Council for consideration at the June 13, 2016 work session. The Council agreed that the timeline seemed appropriate and directed staff to move forward with the steps necessary to bring an ordinance for mobile food units the Council by the end of the calendar year.

The first milestone is to review research and regional examples. Tonight's presentation responds to questions posed by the Council at the June 13, 2016 work session regarding preliminary research parameters and framework and presents regional examples contained in recently adopted ordinances regulating food carts in nearby jurisdictions. Attachment C includes the minutes from the June 13, 2016 work session. A table comparing regulations of five jurisdictions is included in Attachment D.

The topic of mobile food vending and food carts was last brought before the Commission on December 17, 2015.

Preliminary Research Results

After adoption of Ordinance 1393-16, staff created a frequently asked questions (FAQ) web page on the City of Tualatin web site to inform the public about temporary mobile food cart provisions included in the Tualatin Municipal Code. Information regarding these new provisions

were also highlighted in the August 2016 issue of Tualatin Today.

With the exception of the PuPu Shack operating on private property at the intersection of SW Boones Ferry Road and Nyberg Street, staff is not aware of other food carts or pods operating in the City at this time. While the intent of the relaxed temporary regulations in Ordinance 1393-16 was to spur food cart operations for observation and data collection, a sufficient sample size of food cart operations has not yet occurred.

Regional Examples

Staff identified five cities that have recently adopted ordinances regulating mobile food carts: Beaverton, Gresham, Hillsboro, Milwaukie, and Tigard. These ordinances were reviewed to determine the status of the most recent regulatory examples for mobile food carts.

Some generalizations among these five ordinances include the following.

- All jurisdictions require local business licenses to operate food carts.
- All jurisdictions require that the individual food cart businesses obtain health or food handler licenses from their respective counties.
- All jurisdictions permit food carts as an outright, limited, accessory, or conditional use in commercial, industrial, and mixed-use planning districts; all jurisdictions prohibit food cart operations in residential (only) districts.
- All jurisdictions emphasize the "vehicular" and "eating and drinking establishment" characteristics of mobile food carts.
- All jurisdictions require food cart and pod sites to be paved and improved.
- With the exception of Hillsboro, none of the jurisdictions place restrictions on hours operation; although Gresham requires a development permit for food and beverage carts that remain on one site for more than four hours in any one day.

The five ordinances differ in the following manner:

- Beaverton, Gresham, and Tigard regulate food carts in their respective development codes. Hillsboro and Milwalkie regulate food carts in their municipal code.
- The actual definitions of mobile food cart/unit/pod and the allowable physical interpretation of the structure defined and regulated vary for each jurisdiction; although all ordinances emphasize mobility and food/beverage service.
- Some of the ordinances, including Beaverton, Gresham, and Milwaukie, require accessory uses such as restrooms and additional parking for food cart and pod users.
- Beaverton requires direct infrastructure (water, sewer, power) connections. Gresham allows temporary connections (and require permits to do so). Hillsboro, Milwaukie and Tigard require food carts to be self-contained and do not allow infrastructure connections.
- Signage regulations vary by jurisdiction. Both Beaverton and Gresham expressly allow signage on food carts/units themselves without stated limitations. Milwaukie and Tigard regulate food cart/unit signage per their respective municipal codes.
- Site conditions/on-site restrictions (e.g., setbacks, blocking pedestrian walkways, occupying required parking spaces) and operational interactions with adjacent uses (e.g., buffer areas, lighting provisions) vary by jurisdiction.

Based on review of the regional examples presented above, staff has the following suggestions:

- Add food cart and/or pod regulations to the Tualatin Municipal Code and limit discussion of food carts/pods in the Tualatin Development Code to which planning districts they would be permitted to operate.

- Adopt the mobile food unit definition as found in Section 2A of Ordinance 1393-16 as the legal definition of food carts as it pertains to food cart and pod operations in Tualatin.
- Restrict food cart and pod operations to sites that have previously undergone Architectural Review (AR) and prohibit such operations on vacant or unimproved sites.
- Require food carts and pods to be self-contained and prohibit direct connections to the City's water, sanitary sewer, and storm water systems.
- Require food carts and pods to be responsible for solid waste and recycling collection and removal.
- Restrict signage to the vehicle itself.

Staff is seeking Commission input on the following possible components of the ordinance.

- Determining level of permit review for food carts/pods (staff level vs. City Council vs. Planning Commission).
- Adopting a specific permit or license for food cart operations.
- Requiring temporary accessory uses such as restrooms, seating and parking for food cart/pod operations.
- Restricting the number of food carts at any one location (prohibiting pods).
- Regulating overall hours of operation.
- Adopting Gresham's food and beverage cart design guidelines, which states that arts most be mobile but cannot operate from a motorized vehicle (example: a trailer modified to serve food but not a food truck or RV).

Next Steps

Staff will return to City Council and Planning Commission in October to present results from public outreach and to discuss policy direction on components of the food cart ordinance, which will be presented for Council consideration in November. Next steps include the following.

- Continue to research and monitor food cart operations in Tualatin.
- Collect feedback from public engagement efforts.
- Incorporate policy recommendations from both City Council and Planning Commission.
- Present draft PTA and ordinance to City Council and Planning Commission.

Attachments: Attachment A: Ordinance 1393-16
Attachment B: Mobile Food Vending Timeline
Attachment C: City Council Work Session Minutes (June 13, 2016)
Attachment D: Food Carts Comparison Table

ORDINANCE NO. 1393-16

AN ORDINANCE TEMPORARILY ALLOWING MOBILE FOOD UNITS TO OPERATE IN THE CITY OF TUALATIN

WHEREAS, Mobile Food Units, defined in OAR 333-150-0000, can allow individual entrepreneurship at a small scale and provide unique eating establishments for the public; and

WHEREAS, Council is currently reviewing and considering new code provisions to allow Mobile Food Units to operate in Tualatin; and

WHEREAS, Council wants to temporarily allow Mobile Food Units to operate in Tualatin until such time as Council can approve permanent regulations.

THE CITY OF TUALATIN ORDAINS AS FOLLOWS:

Section 1. Purpose. The purpose of this Ordinance is to temporarily allow Mobile Food Units to operate in the City until such time as the Council can consider and establish permanent regulations.

Section 2. Mobile Food Units Allowed.

A. Mobile Food Units mean any vehicle that is self-propelled or that can be pulled or pushed down a sidewalk, street, highway or waterway, on which food is prepared, processed or converted or which is used in selling and dispensing food to the ultimate consumer.

B. Mobile Food Units are allowed to operate on private property in all Commercial and Industrial planning areas within the City.

C. Mobile Food Units must obtain a business license under Tualatin Municipal Code 9-01.

D. Operation of Mobile Food Units on City property and rights-of-way is subject to the permitting requirements of the City, as provided in the relevant sections of the Tualatin Municipal Code and Tualatin Development Code.

Section. 3. Ordinance Not Codified. This ordinance will be known as Tualatin's Temporary Mobile Food Unit Regulations and it being temporary, will not be codified in the Tualatin Municipal Code.

Section 4. Severability. Each section of this ordinance, and any part thereof, is severable. If any part of this ordinance is held invalid by a court of competent jurisdiction,

the remainder of this ordinance shall remain in full force and effect.

Section 5. Emergency. This ordinance is necessary for the immediate protection of the public peace, health, safety and welfare and takes effect immediately upon adoption.

Section 6. Ordinance Expiration. This ordinance automatically expires and is to be deemed repealed on December 31, 2016, unless sooner repealed or extended by Council ordinance.

Adopted by the City Council this 13 Day of June, 2016.

CITY OF TUALATIN, OREGON

BY _____
Mayor

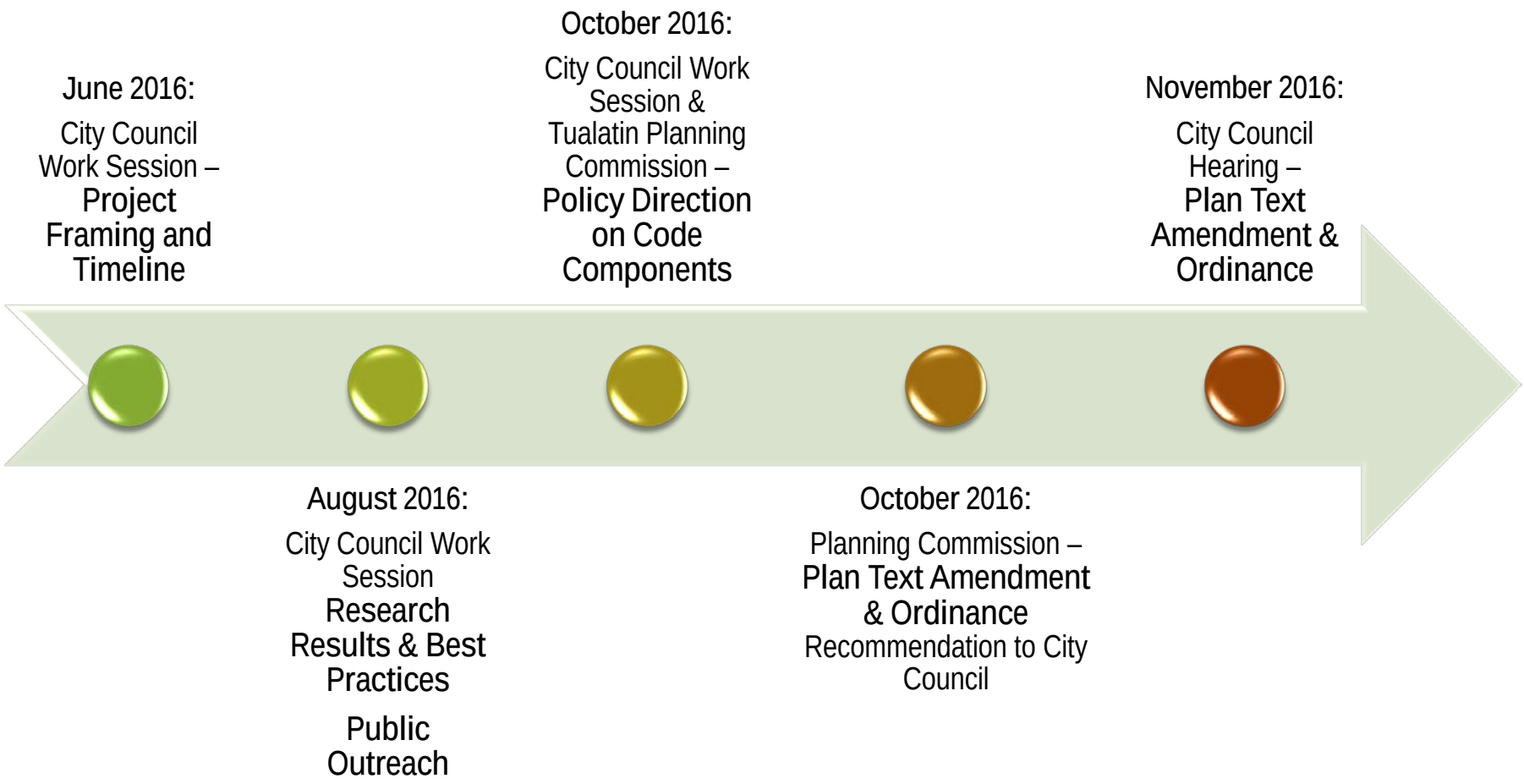
APPROVED AS TO FORM

BY _____
City Attorney

ATTEST:

BY _____
City Recorder

Timeline - Mobile Food Vending



Updated September 6, 2016

APPROVED BY TUALATIN CITY COUNCIL
Date 6/27/16
Recording Secretary N. Morris

STAFF REPORT
CITY OF TUALATIN

TO: Honorable Mayor and Members of the City Council

THROUGH: Sherilyn Lombos, City Manager

FROM: Nicole Morris, Deputy City Recorder

DATE: 06/27/2016

SUBJECT: Consideration of Approval of the Minutes for the Work Session and Regular Meeting of June 13, 2016

ISSUE BEFORE THE COUNCIL:

The issue before the Council is to approve the minutes for the Work Session and Regular Meeting of June 13, 2016.

RECOMMENDATION:

Staff respectfully recommends that the Council adopt the attached minutes.

Attachments: City Council Work Session Minutes of June 13, 2016
City Council Regular Meeting Minutes of June 13, 2016

APPROVED BY TUALATIN CITY COUNCIL
Date 6/27/16
Recording Secretary

OFFICIAL MINUTES OF TUALATIN CITY COUNCIL WORK SESSION FOR JUNE 13, 2016

Present: Mayor Lou Ogden; Council President Monique Beikman; Councilor Frank Bubenik; Councilor Joelle Davis; Councilor Ed Truax

Absent: Councilor Wade Brooksby; Councilor Nancy Grimes

Staff Present: City Manager Sherilyn Lombos; City Attorney Sean Brady; Police Chief Kent Barker; Community Services Director Paul Hennon; Finance Director Don Hudson; Planning Manager Aquilla Hurd-Ravich; Assistant to the City Manager Tanya Williams; Assistant City Manager Alice Cannon; Associate Planner Erin Engman; City Engineer Jeff Fuchs; Associate Planner Charles Benson; Senior Planner Karen Fox

CALL TO ORDER

Mayor Ogden called the meeting to order at 5:10 p.m.

1. *Mobile Food Carts.*

Associate Planner Charles Benson and Planning Manager Aquilla Hurd-Ravich presented a summary of framing for the mobile food cart project. The Pupu Shack could not operate per current TDC 34.013 regulations last year in the parking lot of Clark Lumber. Planner Benson discussed different types of food carts to be considered, which included: push carts, stationary carts, mobile food trucks and catering trucks. He discussed operational regulations to be considered such as: locations, hour limitations, design limitations and items of sale. Considerations of configuration of devices such as: stand alone structures, buildings, and multiple food carts operating in the same area. Options for permitting and review were discussed. Associate Planner Benson discussed public engagement proposing online surveys, questionnaires and outreach to local businesses. Citizens would be provided the opportunity to comment and provide testimony at City Council public hearings. The timeline is set to be completed by the end of the calendar year.

Mayor Ogden would like to know what ordinances are in place for surrounding cities. Manager Hurd-Ravich stated they are currently in the process of obtaining this information with the intention of presenting information at a work session in July.

Councilor Bubenik expressed his concerns of stationary food carts and the ascetic of what they may look like. He suggested researching all four options presented.

Councilor Truax believes catering trucks are a non issue. They currently operate around the city and serve industrial business parks. He stated complaints from business owners and their perception of potential loss of business needs to be considered. He stated he feels Tualatin does not have enough traffic to support stationary carts. Overall he wants to allow more opportunities for mobile food carts, not prevent them from having a business in Tualatin.

Councilor Davis would like to see what other cities are doing and then narrow down the options. She does not support being restrictive at this point.

Mayor Ogden likes the idea of having food carts in parking lots of businesses but does not want to see stationary food carts in Tualatin. He is in favor of food carts that are truly mobile and can be moved daily. He would like to ensure the standards of mobile food carts are in line with those which are in place for brick and mortar businesses.

Councilor Truax stated he supports the trial period this summer. Mayor Ogden concurred.

Manager Hurd-Ravich asked the Council for clarification regarding approval of their plan for public engagement.

Councilor Bubenik would like to see feedback from both citizens and local businesses. Councilor Davis agreed and would like to see a presence online as well.

2. ***Basalt Creek Concept Plan Update.***

Senior Planner Karen Fox, Assistant City Manager Alice Cannon, and Planning Manager Aquilla Hurd-Ravich presented an update on the Basalt Creek Concept Plan. In December 2015, a joint Council meeting was held with Wilsonville. Two actions were achieved during this meeting including the jurisdictional boundary being agreed upon and ten considerations of success were discussed. The ten considerations included sewer, storm water, industrial lands, transportation funding, future regional transportation projects, trips, Basalt Creek parkway and I-5 Crossings, North-South collector, Basalt Creek Canyon, and public transportation.

Manager Hurd-Ravich explained the maps showing suitable land for development and the three different options for land use and development. Assistant City Manager Cannon added that feedback received in December regarding residential land use and the expressed desire for more employment land was addressed. Manager Hurd-Ravich explained the different land use options and trips associated with each type of land use. Assistant City Manager Cannon stated Wilsonville is using part of their land as high tech, which will up the trip limit and potentially cause an excess.

Councilor Bubenik asked if they are anticipating having people live and work in the same area. Assistant City Manager Cannon explained Wilsonville doesn't have a lot of residential land in this part of their city and they don't believe there would be a high demand for residences in that specific area.

Manager Hurd-Ravich stated they are currently working on a concept plan using recent activity and feedback from meetings. Next steps include having another agency review team review the draft concept plan.

Assistant City Manager Cannon asked for feedback from the Council on the ten considerations and what their vision entails.

Council President Beikman stated previously there was emphasis on not making

changes due to the trip count so she was surprised by the new numbers.

Councilor Bubenik asked for an estimate of the trip count with the proposed changes. Assistant City Manager Cannon stated they do not have the current trip count estimate but noted it is within the range of working something out. Finding a balance on the trip count will require compromise for both cities.

Mayor Ogden commented on the high tech zone and would like to know if it is the best use of the land. He stated high tech allows for higher paying wages and with the limited acres he would like the best use of the land. Manager Hurd-Ravich stated they could look at changing the employment mix of land use. She noted light industrial tech flex allows for a certain amount of open space which brings the trip count down.

Mayor Ogden stated he does not want the transportation system to fail. Noting both cities need to come to an agreement on how trips can be used proportionate to the acres allotted. Each city will then have a trip limit and it will be up to the city to use the trips as they see fit. Assistant City Manager Cannon clarified the suggestion is to have an equal number of trips per developable acre.

Councilor Bubenik asked which zone type has the highest capacity for generating trips. Assistant City Manager Cannon stated high tech zoning has the highest trip count and residential has the lowest.

Councilor Truax suggested residential areas will have to be added to bring the trip count down.

Councilor Bubenik wanted to make sure staff is responding to the email from Grace Lucini. He requested the Council be included on responses.

3. ***Council Meeting Agenda Review, Communications & Roundtable.***

Councilor Bubenik stated parking on Hazelbrook Road is becoming an issue with cars on both sides, causing one lane for traffic to travel. He requested staff make sure the standards are being met. Assistant City Manager Cannon stated staff is looking into the issue by the direction of the City Manager.

ADJOURNMENT

The work session adjourned at 6:38 p.m.

Sherilyn Lombos, City Manager

Merab Smith / Merab Smith, Recording Secretary

Ed Truax / Ed Truax, Mayor Pro Tem

Tualatin Food Trucks Plan Text Amendment (PTA)
Best Practices Matrix

Jurisdiction	TUALATIN	Washington County			Clackamas County	Multnomah County
		Tigard	Hillsboro	Beaverton	Milwaukie	Gresham
Predominent Governing Document	Tualatin Municipal Code (TMC): Ordinance No. 1393-16, *Temporary Mobile Food Unit Regulations*	Tigard Community Development Code (TCDC)	Hillsboro Municipal Code: Chapter 5, Business Licenses and Regulations: Subchapter 5.36, Sidewalk Vendors and Cafes	Beaverton Development Code, Chapters 20, 40,60	Milwaukie Municipal Code (MMC)	Gresham Development Code Section 10.1600
Defining Term	Mobile Food Units (OAR 333-150-0000)	Mobile Food Cart (trailer or vehicle as found in ORS Sections 801.560 and 801.590)	Mobile Businesses; Mobile Devices; Sidewalk Vendors	Food Carts/Food Cart Pods	Mobile Food Carts (MMC Section 19.201 Definitions)	Food & Beverage Carts
Definition	Any vehicle that is self-propelled or than can be pulled or pushed down a street, sidewalk, street, highway or waterway, on which food is prepared, processed or converted or which is used in selling and dispensing food to the ultimate consumer.	Eating and Drinking Establishments are characterized by the sale of prepared food and beverages for consumption on-site or take-away (TCDC 18.130.060.F)	Not expressly defined in Municipal Code (or Development Code, which is subset).	A Food Cart is "a mobile vehicle, such as a food truck, trailer or cart, from which service of food and/or beverages is provided to walk-up customers." A Food Cart Pod is defined as "a site containing one or more food carts and associated amenities on private property."	"Vehicle" means a device in, upon, or by which any person or property is or may be transported or drawn upon a public street, except devices moved by human power or used exclusively upon stationary rails or tracks. "Eating establishment" means a restaurant or other similar business establishment with the primary function of serving food, prepared to order, to the public, and may serve alcoholic beverages at the dining table. This establishment may or may not have an attached drinking establishment.	The sale of goods or merchandise from a location outside of a building in a mobile unit where at least 50 percent of the sales is a combination of food and beverages. Examples include coffee carts and carts or trailers designed to serve food. Exceptions include residential lemonade stands and similar short-term sales associated with residential uses. **Must be mobile units but cannot operate from motorized vehicles: example is a trailer modified to serve food, but NOT a food truck or RV).
Local Permits Required			Sidewalk vendor permit (for operations on a public sidewalk); mobile business permit		Electrical permit (for work in or on the cart)	Gresham Food & Beverage Cart permit; Gresham Fire Protection permit
Local Licenses Required	Tualatin business license (TMC 9-01)	Tigard business license	Hillsboro business license	City of Beaverton Business License	City of Milwaukie business registration	Gresham business license
County Licenses Required	Washington County Health License	Washington County Health License	Not specifically mentioned in municipal code as the code refers to Mobile and Temporary Businesses, but business must comply with all applicable federal, state, and local regulations.	Washington County Health License	Mobile unit plan review; Mobile unit commissary & warehouse license, environmental health service license, restaurant license, food handler's license	Multnomah County Health Department license; Mobile food unit plan
PRIVATE/PUBLIC PROPERTY						
Location Guidelines--Planning Districts	All commercial and industrial planning districts	Commercial (C-C, C-G, C-P); Mixed Use (MU-C, MUE, MUC, MUC-1, MUE, MUR-1, MUR-2); Industrial (I-P)	For operations in excess of 20 minutes in any one day on a single property: Commercial or industrial use; Multi-family residential uses > 10 units	Commercial (NS, CS, CC, CG); Employment/Industrial (OI); Multiple Use (RC-TO, RC-OT, RE-E, OI-WS, C-WS,TC-MU, SC-MU, SC-S)	Allowed Outright: mixed use (GMU, DMU, NMU); commercial (C-G); industrial (M-TSA); Limited Use: industrial (BI); Accessory Use: industrial (M); Conditional Use: commercial (C-N)	Commercial and mixed-use districts; allowed on sites of approved institutional uses (with limitations)
Location Guidelines--Surface Conditions		Paved surface required.	Improved surface (concrete or asphalt) required.	Paved or concrete surface required.	Existing paved surface required.	Paved surface required.
Location Guidelines--Site Conditions/On-Site Restrictions		Must be located on site with an existing structure; must meet setback requirements; must not obstruct vehicular or pedestrian circulation; must not occupy a required parking space without providing a replacement.	Must not block or occupy minimum parking spaces required for existing use; must not block public ROW, fire lane, or vision clearance area; mobile push cart/food cart may not operate within 100 feet and on the same block face of a retail outlet offering the same or similar commodity.	Not to occupy pedestrian walkways or landscaped areas; front yard setbacks of 6 feet; side and rear setbacks follow underlying zoning; buffer widths required when adjacent to residential uses; lighting standards as to not affect neighboring properties.	Existing paved surface; must not occupy a required parking space without providing a replacement per MMC 19.600	Not to occupy pedestrian walkways or landscaped areas; must meet setback standards of host district; queue distance standards for drive-up uses; distance from ROW and driveway entrance regulations; lighting and visual requirements for safety/crime prevention purposes and as to not affect neighboring properties.
Location Guidelines--Accessory Uses		None required. (Cart must be located on site with existing structure, but that structure does not have to provide restrooms.)	All temporary buildings, equipment, furniture, wastebaskets, and other stand-alone items must be placed in immediate vicinity of mobile business and must be removed from the site upon cessation of business operations.	Pods that providing seating must provide restrooms on-site or adjacent property and screened from public ROW or adjacent residential properties; waste/storage and shelter structure requirements.	Restrooms required within quarter-mile or 5-minute walk of food cart pod (per Clackamas County regulations).	Restrooms required for employees and carts that service food to walk-up customers--can be on-site or within quarter mile or 5-minute walk of cart.
Design Guidelines--Carts		Must have wheels and wheels must not be removed; canopies, awning, or attachments must be entirely supported by cart and not touch the ground.	None discussed.	Wheels and tongues must remain on cart, and whiles must remain inflated; carts shall have a minimum of 7 feet of clearance between the ground and the awning to allow access for pedestrians under the awningcarts and accessory uses should be kept in state of good repair; mobile units should not exceed 26 feet in length.	Must have wheels and wheels must not be removed; canopies, awning, or attachments must be entirely supported by cart and not touch the ground. Food carts on private property in downtown Milwaukie are not subject to design review, but high-quality materials, attractive colors and designs are encouraged.	Awnings attached to Food and Beverage Carts shall have a minimum of 7 feet of clearance between the ground and the awning to allow access for pedestrians under the awning; carts and accessory uses should be kept in state of good repair; mobile units should not exceed 26 feet in length.

Tualatin Food Trucks Plan Text Amendment (PTA)
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Jurisdiction	TUALATIN	Washington County			Clackamas County	Multnomah County
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Design Guidelines--Utility/Infrastructure		Must not require any plumbing or electrical connection that require permits.	No water, sanitary sewer, or stormwater connections allowed between mobile business and any utility systems; electrical connection must be of the type that can be quickly disconnected and must comply with all applicable laws.	Must connect to water, sanitary sewer, and power source per applicable codes; all utilities must be placed underground.	Must be self-contained and not require any plumbing connections.	Any desired utility connections (i.e., water, sewer, electricity) will require permits and connections must be temporary in nature; applicants must provide wastewater/graywater disposal documentation; no direct discharge to City's wastewater or stormwater systems.
Design Guidelines--Signage		Subject to Tigard's sign code, no food cart regulations called out separately.	None discussed.	Signs are allowed on the food cart itself; freestanding signs are subject to provisions in Chapter 60.40.35.3.	Subject to MMC 14.16 Sign Districts.	Signs are allowed on the cart, plus one readerboard or A-board sign per street frontage; sign rules are in Appendix 6 of development code.
Operational Guidelines--Pods		Yes. More than one cart per property is allowed provided each meets design and location requirements. No other pod regulations at this time.	None discussed.	Yes. Carts must be 6 feet from each other; pods in commercial and industrial districts must provide one parking space per food cart (multiple-use zones exempt from parking requirement).	None discussed.	Yes. Carts must be 10 feet from each other; on pod sites that are close to street at least 1/3 must face street with service window.
Operational Guidelines--Hours of Operation		No restrictions on hours of operation.	Must not exceed 6 operating hours and 1 setup/takedown hour (for a total of 7 hours) per day; business can only operate between 8 AM and midnight in commercial areas > 50 feet from residential areas, and from 8 AM to 9 PM in all other permitted areas.	No restriction on hours of operation, but lighting must be provided during hours of darkness if carts/pods are open for business.	No restrictions on hours of operation.	Food and Beverage Carts shall be required to acquire a development permit if they remain on one site more than four hours in any one day.
PUBLIC ROW						
General Regulations/Guildelines		None currently. Tigard Engineering department is currently researching this.	Cannot block public ROW, vision clearance area, or fire lane.	Carts/pods cannot occupy pedestrian walkways (sidewalks), fire lanes or other emergency access areas, or vision clearance areas.	No difference in public or private property regulations at this time. Completed recent survey regarding interest in pods on public property (triangle area near downtown MAX station).	Carts cannot occupy pedestrian walkways (sidewalks).
Info Source(s)		City of Tigard, "Mobile Food Carts on Private Property;" phone call with Lloyd Purdy on 08/09/2016.	Hillsboro Municipal Code.	City of Beaverton, "Food Cart Pods FAQ;" Beaverton Development Code	City of Milwaukie, "Mobile Food Carts on Private Property;" City of Milwaukie 'Food Carts' hand-out; phone call with Vera Kolias on 08/02/2016.	City of Gresham, "Food & Beverage Cart Permit Information;" Gresham Development Code, Section 10.1600, "Food & Beverage Carts.
Notes/Current Conditions/Status		Current regulations are for individual trucks only, no pods. No public survey, regulations based on "sensible ideas." Conducted successful 4-week test run (twice) in dense area near City Hall.			Currently about 6 carts operating in Milwaukie. City is actively courting the public to support pod on publicly-owned land at downtown MAX station.	*Includes section addressing how carts operating under temporary use permit (similar to Tualatin Municipal Code) can convert to permanent use.
Contact		Lloyd Purdy, Economic Development Manager (503) 718-2442			Vera Kolias, Associate Planner (503) 786-7653	POD (503) 618-2780